A comparative analysis of two tutoring methods assessing student achievement and retention
by Debra Davis Merwin

A thesis submitted in partial fulfillment of the requirements for the degree of Doctor of Education
Montana State University

Abstract:
The purpose of this study was to compare the effectiveness of two tutoring methods with regard to achievement and retention for high-risk undergraduate students. The two tutoring methods were group tutoring (i.e., Supplemental Instruction, or SI) and individual tutoring.

The problem was investigated by: (1) examining how the tutoring methods and other independent variables affected student achievement and student retention, and (2) comparing the two tutoring methods in terms of cost effectiveness. Achievement was measured by the pretest-posttest gain score from the Tests of Adult Basic Education (TABE). Retention was measured by the ratio percentage of the number of student credit hours earned compared to the number of hours attempted for the first and second years following treatment.

The major findings were: (1) Non-traditional students had higher achievement gains than did traditional students; (2) Native American students did as well as Caucasian students on measures of achievement; (3) students in SI tutoring had higher retention rates than students receiving individual tutoring for the first and second years following treatment; (4) Caucasian students had better retention rates than Native American students for the first and second years following treatment; (5) the traditional students had better retention rates than non-traditional students, for the first year only, after treatment; (6) high school graduates had better retention rates than GED students for the first and second years following treatment; (7) the combined results of the two tutoring methods did make a significant difference in student achievement; (8) the SI tutoring method compared to the individual tutoring method was more cost effective; and (9) tutoring had a relatively short-term effect.

Recommendations for further study included: (1) examining the merits, effectiveness, and value of different tutoring methods, particularly with students who do not volunteer but who are assigned to tutoring; (2) devising and testing a diagnostic screening process to determine whether group or individual tutoring is more appropriate for students; (3) evaluating the attitudes and values of the tutors, faculty, staff, and students involved with academic assistance programs; and (4) investigating the best learning environments related to ethnicity. Additionally, SI tutoring and tutoring for subsequent academic terms were generally advised.

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by

Debra Davis Merwin

A thesis submitted in partial fulfillment
of the requirements for the degree

of

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APPROVAL

of a thesis submitted by

Debra Davis Merwin

This thesis has been read by each member of the graduate committee and has been found to be satisfactory regarding content, English usage, format, citations, bibliographic style, and consistency, and is ready for submission to the College of Graduate Studies.

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ABSTRACT

The purpose of this study was to compare the effectiveness of two tutoring methods with regard to achievement and retention for high-risk undergraduate students. The two tutoring methods were group tutoring (i.e., Supplemental Instruction, or SI) and individual tutoring.

The problem was investigated by: (1) examining how the tutoring methods and other independent variables affected student achievement and student retention, and (2) comparing the two tutoring methods in terms of cost effectiveness. Achievement was measured by the pretest-posttest gain score from the Tests of Adult Basic Education (TABE). Retention was measured by the ratio percentage of the number of student credit hours earned compared to the number of hours attempted for the first and second years following treatment.

The major findings were: (1) Non-traditional students had higher achievement gains than did traditional students; (2) Native American students did as well as Caucasian students on measures of achievement; (3) students in SI tutoring had higher retention rates than students receiving individual tutoring for the first and second years following treatment; (4) Caucasian students had better retention rates than Native American students for the first and second years following treatment; (5) the traditional students had better retention rates than non-traditional students, for the first year only, after treatment; (6) high school graduates had better retention rates than GED students for the first and second years following treatment; (7) the combined results of the two tutoring methods did make a significant difference in student achievement; (8) the SI tutoring method compared to the individual tutoring method was more cost effective; and (9) tutoring had a relatively short-term effect.

Recommendations for further study included: (1) examining the merits, effectiveness, and value of different tutoring methods, particularly with students who do not volunteer but who are assigned to tutoring; (2) devising and testing a diagnostic screening process to determine whether group or individual tutoring is more appropriate for students; (3) evaluating the attitudes and values of the tutors, faculty, staff, and students involved with academic assistance programs; and (4) investigating the best learning environments related to ethnicity. Additionally, SI tutoring and tutoring for subsequent academic terms were generally advised.

CHAPTER 1

INTRODUCTION

Due to a variety of social and economic factors, retention of students in higher education has become a frequent area for study over the past 60 years. Robert Cope, in the forward of *What Works in Student Retention*, provided an historical perspective on student retention research in higher education:

> Early studies on retention (before World War II) were largely descriptive. We learned, among other things, that commuter students with lower aptitudes and students from small towns tended not to complete college. Then, after World War II, the emphasis in retention research shifted to prediction. Given commuting, certain scholastic test scores, and town size, what was the likelihood of completion? In the late 1950s, attention shifted to typologies of student dropouts and to the experiences students were having while in attendance. It was not until the 1970s that serious consideration was given to the institutions themselves. But now studies have begun to focus on the quality of faculty-student interaction, the types of degree programs available, the adequacy of student residences, the mix of financial aid, and so on. The emphasis has clearly shifted in improving the quality of higher education in order to retain the confidence of students. (Beal & Noel, 1980, p. v)

Cope's contention was that sufficient student retention research data have been generated by using primarily fixed variables such as family size,

social status, high school grade point average, intelligence quotients, sibling order, and gender. Nevertheless, the demographic decline of the traditional 18-year-old high school graduate, coupled with an increase in the institutional cost of higher education and enrollment-based funding formulae, have all been factors promoting considerable research interest in student retention. Various researchers (Astin, 1975, 1985; Noel, Levitz, Suluri, & Associates, 1985; Ramist, 1981; Sexton, 1965; Snow, 1977; Tinto, 1975, 1987; Wilder, 1983) have indicated that the need for additional data in student retention is clearly evident. A viable alternative to using solely the fixed variables of earlier studies would be to concentrate on proactive variables such as freshman orientation, counseling, academic assistance, and advising programs. Noel et al. (1985) found that successful institutions know that ultimately student retention is a by-product of meeting student needs through the quality of campus programs and services.

Therefore, the focus of this study was to examine the effectiveness of one representation of an academic assistance program. Academic assistance programs have historically been used with high-risk students who lack the basic skills needed to complete their course of study. Special programs that offer academic assistance to students at institutions of higher education were initiated over 90 years ago (Cross, 1979). In 1894, Wellesley College developed what may have been the first remedial course for college students. The explosion of special programs and remedial courses aimed at helping

high-risk students became most apparent during the Civil Rights Movement of the 1960s. The Civil Rights Movement encouraged the expansion of open-admission colleges to provide access for those who had previously been denied an opportunity for higher education.

According to Martin, Blanc, and DeBuhr (1983), special programs have tended to serve small numbers of students at a high cost per student. Some of these special programs have been funded federally by grants known as Special Services, Talent Search, and Upward Bound. There is a paucity of empirical data focused upon special program effectiveness (Tinto & Sherman, 1974). The investigator found, in an extensive review of the literature, that this scarcity still appears to exist. "Despite the great wealth of information on retention programs, that body of accumulated experience and research has yet to be synthesized in a form readily translatable into action by individual institutions of higher education" (Tinto, 1987, p. 215). Furthermore, the student attrition rate among high-risk groups continues to be a concern for administrators because declining attendance impacts enrollment-driven budgets.

This study examined an academic assistance program that was implemented at Northern Montana College (NMC). NMC is one of the six units of the State University System of Montana, and is located in Havre. NMC serves the needs of many placebound students in north central Montana who have attended small rural high schools. A student profile at NMC, according to an American College Entrance Test (ACT) entering student survey, disclosed that there was a significant non-traditional student population; a 14% minority

population that was Native American; approximately a 60% male and a 40% female student population; 90% of all entering students came from within the state of Montana; 63% of all entering students and 94% of Native American students received some type of financial aid and one-third worked while attending school (Fossen, 1985).

Little retention data had been systematically documented at NMC prior to this time. However, the registrar's office had begun to monitor figures regarding retention and estimated that the attrition rate from fall of 1985 to fall of 1986 was between 53% and 60%. Unfortunately, this suggests that only 40% to 47% of the students enrolled in fall quarter of 1985 returned in the fall of 1986. In addition to the high dropout rate, mean scores for entering freshmen on the ACT were also a concern at NMC. A study conducted by the NMC college Learning Center in 1985 found the mean composite score on the ACT was 15 for entering freshmen; according to ACT's national norms, these scores, coupled with various other factors such as high school grade point averages (GPAs), placed approximately 78% of these students in the scholastically underprepared category.

Need for the Study

The study's need has been determined through practical as well as theoretical considerations. The practical considerations focused on the need for an effective and economical strategy to enhance student achievement and subsequent retention. The theoretical considerations were cited by other retention research efforts in similar and related settings.

Confronted with enrollment-driven funding formulae and declining numbers of high school graduates, college administrators during the past 25 years have initiated a wide variety of student achievement/retention strategies. Typically, academic assistance programs have been established to provide developmental instruction for high-risk students. Perhaps the most commonly used instructional method in the developmental setting is tutoring. However, because of the one-to-one tutor-to-student ratio, the cost is often prohibitive. The group tutoring method employed in the Supplemental Instruction (SI) model appears to offer a less expensive alternative to the traditional one-to-one tutoring. While SI may be less costly, there were unanswered questions regarding its efficacy with student achievement and retention among those classified as high-risk as defined by this study's population.

A consensus exists among retention researchers that more research in the field is warranted (Astin, 1975, 1985; Noel et al., 1985; Ramist, 1981; Sexton, 1965; Snow, 1977; Tinto, 1975, 1987; Wilder, 1983). More specifically, there is a paucity of retention research conducted in a local college setting (Astin, 1975; Ramist, 1981; Terenzini, 1980). Sexton (1965) stated that local studies are important since developing universally applicable methods of prevention and cure are impossible. Astin (1985) indicated further need for more retention research focusing on academic achievement among high-risk groups. Further, the academic assistance research literature abounds with discrepant findings. Tinto and Sherman (1974) concluded that little is known

about the long-term effects of academic assistance programs that profess to assist in student retention. More specifically, the researchers suggested that longitudinal studies be conducted employing statistical analyses that would reveal data on the multiple factors contributing to observed effects of the program.

The population for this study served a distinctive investigative interest because of the relatively high enrollment of Native American and vocationally oriented students. NMC has a student enrollment of Native Americans that is approximately 14%. This is the highest percentage of Native American students enrolled in any unit of the Montana University System. NMC also has a large percentage of students enrolled in vocational-technical majors or minors. Therefore, the findings from this study may best be generalized to open-admission institutions such as vocational-technical schools and even community colleges.

Finally, Tinto and Sherman (1974) have been critical of research about academic assistance programs because program participants take part voluntarily, thus building in a bias for program evaluation. This study, however, looked at a program where participation was not voluntary, but rather a course requirement as stipulated by the English department faculty and the administration. This requirement was considered an anomaly for academic assistance programs. Consequently, this study is thought to have

a need well-founded by other documented retention research efforts as well as local practice.

Statement of the Problem

The problem of this study was to compare the effectiveness of two tutoring methods (group tutoring and one-to-one tutoring) with regard to achievement and retention for high-risk undergraduate students at Northern Montana College.

General Questions to Be Answered

(1) To what extent did the two tutoring methods (group tutoring and one-to-one tutoring) affect student achievement?

(2) To what extent did the two tutoring methods (group tutoring and one-to-one tutoring) affect student retention?

(3) How did the methods of tutoring compare in terms of cost effectiveness?

General Procedures

This study investigated the effectiveness of an academic assistance program that was implemented at Northern Montana College. It utilized a quasi-experimental design that is *ex-post facto.* The population consisted of students who enrolled in English 150 at Northern Montana College during the 1986-87 academic school year, which included the quarters of fall, winter, and

spring. English 150 was an introductory course that was considered developmental in content. Therefore, admission to this course was determined by the Freshman English Placement Examination administered by the English department faculty. These faculty strived to standardize English 150 by employing systematic grading formats and allotted time-frames for work on sentence structure, parts of speech, grammar, usage, punctuation, and paragraph development.

In implementing this academic assistance program, English 150 students were required to take treatment; that is, they received traditional one-to-one tutoring or group tutoring, which is termed Supplemental Instruction (Si). Six sections of English 150 were offered during fall quarter, three sections during winter, and two sections during spring. Enrollments, for the most part, were held to a maximum of 25 students per section. Random assignment of students to sections was not possible; however, the determination of which section received which treatment was accomplished by randomly picking section numbers "out of a hat." Six sections of English 150 were taught by four different instructors fall quarter, three sections were taught by two different instructors winter quarter, and two sections were taught by two different instructors spring quarter.

The treatment, either SI (group tutoring) or traditional one-to-one tutoring, was a mandatory course requirement for English 150. This means that two, 50-minute tutoring sessions were required of students each week.

The scheduling of tutoring sessions was determined by a questionnaire administered at the beginning of the quarter that denoted convenient times for students (see Appendix A).

Pretests and posttests were given respectively at the beginning and end of each quarter for students enrolled in English 150. This exam is known as the Tests of Adult Basic Education (TABE). The TABE test for English measured students' competency in capitalization, punctuation, expression, and spelling. Initial group equivalence on the pretest for the study was analyzed by using a t-test to determine the significance of the difference between the means; if the means were not equivalent, an analysis of covariance would have been used. Data on the posttest were analyzed with a series of two-way analyses of variance (ANOVA). ANOVAs were used to determine if there was a significant difference in achievement in relation to the independent variable. A Chi-Square Test of Independence was used to examine the difference between expected and observed rates of retention. Retention was measured by the number of successfully completed student credits after one year, and again after two years following the time students completed the Supplemental Instruction or one-to-one tutoring. The cost effectiveness of both tutoring methods was compared by determining the cost of one grade level of improvement.

A grant to fund this academic assistance program was written by the investigator and generously funded by the First Bank System. The program

was implemented under the auspices of the Northern Montana College Learning Center, a division within the Student Services Department. The Learning Center (LC) had the designated administrative role and responsibility for all academic assistance programs.

Limitations of the Study

The following were assumptions that limited the study:

(1) No one instructor taught all sections of English 150. Therefore, it was not possible to control specifically for individual instructor effectiveness by having one faculty member teach all sections of English 150. However, all English faculty who taught English 150 were trained specifically concerning the teaching techniques used in both of the tutoring methods; this tended to promote similar background knowledge.

(2) A control group receiving no treatment was not possible for this study. Faculty and administrators agreed at the time of program implementation that mandatory tutoring could not be required of some and not of others. Also, to discriminate relative to which individuals received tutorial assistance posed a serious ethical concern.

(3) Since the study was conducted under the auspices of the Learning Center (LC) and the Special Services program, adherence to departmental procedures was incorporated into the study. For example, the TABE test was used to provide a consistent measure since that test was

prescribed by the LC staff for any student who received tutoring. Ideally, perhaps a different basic skills test might have been used, such as the Tests of Achievement and Proficiency used in conjunction with the Iowa Tests of Basic Skills, when a student scores below a ninth-grade equivalency.

Delimitations of the Study

The following were delimiting factors pertinent to this study:

(1) The established population was confined to students enrolled in English 150 at Northern Montana College for the 1986-87 academic school year.

(2) The study confined retention variables to those defined in the problem statement. Intervening variables may have a greater effect on retention than the academic assistance methods. Examples of possible intervening variables that could affect retention are campus policy and regulations, campus image and reputation, location, programs or majors offered, or students' personal or emotional circumstances and financial aid.

Definition and Discussion of Terms

(1) Effectiveness: A tutoring method was considered effective if there was a significant difference in the gain score as measured by the pretest-posttest.

(2) Achievement: Achievement was defined by the amount of improvement measured by the pretest-posttest gain score.

(3) Retention: Retention was defined by the number of student credits successfully completed with a minimum grade of "C" (i.e., 2.0 or better on a 4.0 scale).

(4) Cost effectiveness: Cost effectiveness was defined by comparing the cost of one grade level of improvement measured by the pretest-posttest gain score for both groups who received tutoring.

(5) High-risk students: High-risk students were defined according to one or more of the following factors: (a) students who did not formally graduate from high school (for example, those who took the Tests of General Educational Development, or GED, to determine high school grade equivalency certification); (b) students who scored 16 or below on the composite of the American College Entrance Test (ACT); (c) NMC English placement scores for students that indicated their English skills underprepared them for college-level work; (d) Tests of Adult Basic Education (TABE) that indicated deficiencies in English competencies; (e) first generation students (that is, students who were the first in their family to attend an institution of higher learning); and (f) students who qualified as economically disadvantaged according to federal guidelines (see Appendices B and C).

(6) Supplemental Instruction (SI) tutoring method: The SI tutoring method was devised in 1975 by Deanna Martin, Robert Blanc, and Larry DeBuhr in the student learning center at the University of Missouri-Kansas City. In 1983, SI was marketed by the American College Testing Program's National Center for the Advancement of Educational Practices. Approximately 400 institutions of higher education have received training in the SI method. SI has also been validated for dissemination by the U.S. Department of Education through the Joint Dissemination Review Panel, which was the first such validation in the field of academic assistance for postsecondary students (Martin et al., 1983).

SI is a group tutoring method that utilizes tutors to assist students in mastering course concepts while simultaneously increasing their competence in reading, reasoning, and study skills. Trained peer tutors in the SI methodology attend their students' course lectures where they take notes, complete assignments, and take exams. These trained tutors are called SI leaders and act as student role models; they have also individually taken English 150 (or its equivalent) for credit.

In the actual tutoring sessions, the SI leader directs the group discussion and encourages students to answer questions. The SI leader answers questions only when no one in the group knows the correct answer. Therefore, these group sessions encourage an

interactive approach to processing information and understanding concepts.

SI has a broad pedagogical theory base which constitutes an integral part of the SI method. SI's theoretical base has adapted learning strategies from theorists Jean Piaget, Benjamin Bloom, and Edgar Dale. In addition to utilizing the learning strategies of Piaget, Bloom, and Dale, the SI method employs specific study skills such as note-taking, reading for comprehension, test-taking, and time management. In conclusion, Martin et al. (1983) stated that "SI assists the student in content review by identifying important relationships, clarifying facts, understanding charts, diagrams and formulae, establishing a meaningful frame of reference, clarifying assignments and predicting test questions" (p. 4). SI accomplishes the former by procedures such as "informal quizzes, reciprocal questioning, learning cycles, and processing notes" (p. 4).

(7) Traditional tutoring method: The traditional tutoring method is one-to-one, meaning that a student receives tutoring from a single tutor. In this method, the tutor does not attend the student's class, so the tutoring process relies heavily on the student to prioritize what is important to emphasize during the tutoring sessions. This method also relies on the student to verbalize what s/he does not understand and to identify areas perceived as problematic.

Unlike the SI method, the one-to-one tutoring method does not formally subscribe to any specific learning theory and related pedagogical practice, although it may be surmised that the more talented tutors intuitively employ a random array of learning strategies.

(8) Tutors: This term refers to those individuals who provided tutoring (either SI or one-to-one) to students enrolled in English 150 classes. Tutors for both the SI and the one-to-one methods were selected based on proven competency in the course, by the grade they received when they took this course, by interviewing with the LC staff, and/or by faculty recommendation.

(9) Academic Assistance Survey: The Academic Assistance Survey refers to a questionnaire which was administered at the beginning of each quarter to assess student interest in the course, motivation for enrolling in the course, year of high school graduation, number of credits they were attempting, hours they expected to work each week if employed, expectations of success in English 150, classification level, ethnic origin, future plans regarding college, and hours available for tutoring (see Appendix A).

(10) Independent variables: The independent variables of this study were the treatment or academic assistance method (either Supplemental Instruction, which was a group tutoring method, or traditional one-to-one tutoring); student ethnicity (i.e., Caucasian, Native American, or

Oriental); student type (i.e., non-traditional or traditional); gender; prior educational attainment before attending college (i.e., high school graduate, GED status, or adult special); and college major (i.e., vocational major or non-vocational major).

(11) Dependent variables: The dependent variables of this study were student achievement and retention.

(12) Student ethnicity: This term refers to the student's race or ethnic background. Native Americans were identified as those students who qualified for the Indian fee waiver, tribal enrollment, and Native American designation under the federal financial aid requirements. Caucasians and Orientals were identified by self-identification on the Special Services application form (see Appendix B) and by computer data base information obtained from the NMC registrar's office.

(13) Student type: Student type refers to non-traditional and traditional student groups, which were differentiated by using the Montana University System's admission policy that defined traditional students as 21 years of age and younger who enrolled in the college for the first time. Therefore, students who were enrolling in college for the first time at age 22 and older were considered to be non-traditional students for purposes of this study.

(14) Vocational major: A vocational major was defined as any student majoring in various vocational and technical areas (i.e., agricultural

technology, auto body, automotive technology, business technology, computer technology, construction technology, diesel technology, drafting technology, electrical technology, electronics technology, farm mechanics, industrial technology, mechanical technology, secretarial technology, metals technology, and nursing technology).

(15) Prior educational attainment: Prior educational attainment was defined by making a differentiation between students' education before attending college. There were three categories of prior educational attainment used for the purpose of this study: high school graduate, GED status, and adult special. College transcripts were collected from the registrar's office to make the necessary designations. Adult specials were those students with neither a high school diploma nor a GED but who, under Northern Montana College's open-admission policy, were admitted under special provisions.

(16) English 150: English 150 was a three-credit course offered each quarter at NMC. The course was considered to be developmental in content since it encompassed the basic skills areas. The 1984-86 NMC catalog description titled this course "Introduction to Communication." The course concentrated on sentence structure, parts of speech, grammar, usage, punctuation, and paragraph development. The course required daily workbook assignments and 8-10 tests. Course admission

was determined by scores attained on the Freshman English Placement Exam.

(17) Freshman English Placement Exam: This test was written, scored, and administered by the faculty of the English department at NMC. The test was a requirement for all freshmen and some transfer students to ensure that students were placed in an English course that was consistent with their competency level.

(18) Longitudinal tracking: Longitudinal tracking consisted of a follow-up on subsequent re-enrollment of students involved in the academic assistance program implemented at NMC. Retention was measured by the number of student credits successfully completed at one-year and two-year intervals following the original tutoring treatment.

(19) Pretest: This term refers to the pretest administered to survey participants, which was Form 3, Level D of the language test component from the Tests of Adult Basic Education (TABE). Students were tested in four areas: capitalization, punctuation, expression, and spelling. Competencies were measured by grade equivalencies that ranged from a fifth-grade level (5.0) to a twelfth-grade/point nine level (12.9).

(20) Posttest: This term refers to the posttest administered to survey participants, which was Form 4, Level D of the language test component from the Tests of Adult Basic Education (TABE). (The posttest

Form 4 and the pretest Form 3 measured identical content areas and competencies.)

(21) Tests of Adult Basic Education (TABE): The TABE were the 1976 edition of achievement tests in reading, mathematics, and language. The TABE tests those basic skills required to function in a society. This test series was adapted from the 1970 edition of the California Achievement Tests (CAT-70). The tests reflect:

> . . . language and content appropriate for adults and measure the understanding and application of conventions and principles; they were not intended to measure specific knowledge or recall of facts. The tests are designed to provide pre-instructional information about a student's level of achievement in the basic skills; to identify areas of weakness in these skills; to measure growth in the skills after instruction; to involve the student in appraisal of his or her learning difficulties; and to assist the teacher in preparing an instructional program to meet the student's individual needs. (Streetman, 1976, p. 1)

Also, as part of the development of TABE, the tests were reviewed by members of minority groups knowledgeable about the ways students learn and perform in test situations. This reviewing procedure conforms to CTB/McGraw-Hill's continuing policy to identify and eliminate ethnic and sex bias in its products (Streetman, 1976).

(22) Special Services Report: The Special Services Report is an application form filed by students at NMC which was required by the Special Services department to determine which students were eligible for services funded by the federal grant (see Appendix B).

CHAPTER 2

REVIEW OF THE LITERATURE

Introduction

Enrollment-driven funding formulae, coupled with a growing influx of high-risk students, have prompted higher education administrators to explore techniques and methods that enhance student achievement and consequent retention. Thus, academic assistance programs have emerged employing a plethora of techniques and methods all thought to contribute to achievement and retention. Many of the academic assistance programs subscribe to the traditional one-to-one tutoring method or tutorial assistance in content fields (Lauridsen, 1980). There are, however, variations of traditional tutoring that appear to be equally effective with measures of achievement and retention and more cost effective. The primary purpose of this study was to determine whether there was a significant difference between the effectiveness of a group tutoring method known as Supplemental Instruction (SI) and the traditional one-to-one tutoring method on measures of student achievement and retention. Thus, the following review of the research literature is focused on the salient emphases of this study.

The first section of this review of the literature focuses on retention research. Historically, retention research has explored reasons why students in higher education have dropped out and what methods and academic assistance programs have been used to retain them. The objectives of reviewing the retention research were two-fold: first, to foster an awareness of the broad field of literature concerning retention in higher education, and second, to provide an understanding of how the need for retaining students affects academic assistance programs.

The second section of this review focuses primarily on the development of academic assistance programs in higher education. Basic skills programs, transition or developmental skills, and various methods of assistance are explored. While the retention studies are comprehensive and abundant, the literature on academic assistance programs is still fairly limited. This may be due in part to the fact that retention efforts prior to the 1970s converged more on descriptive factors rather than student learning outcomes.

Retention Review

Retention has been a multi-dimensional topic in higher education since the 1950s. Retention remains multi-dimensional because there is no single cause for student dropout, but rather many different reasons, as suggested by Astin (1975), Ramist (1981), Sexton (1965), and Tinto (1975).

A broad range of retention studies and strategies abound at individual institutions of higher education across the nation. Not only do a massive number of programs and models appear in the literature, but an equally large number of retention research experts have emerged during the past two decades such as Astin, Maxwell, Pascarella, Ramist, Roueche, Sexton, Snow, and Terenzini. In spite of the volume of information generated, student retention remains somewhat enigmatic. Overall cohesion, congruency, and transferability of successful programs from one institution to another remain in question. The need for research at the local level remains a pivotal concern for each institution (Astin, 1975; Ramist, 1981; Terenzini, 1980).

Historically, the emphasis on retention has been largely descriptive (Astin, 1975; Beal & Noel, 1980; Pascarella, 1982). Descriptive studies have been limited to statements on how various individuals and/or institutional characteristics relate to dropout in education (Tinto, 1975).

Regardless of the limitations, conflicts, complexity, and difficulty in determining what factors contribute to student attrition, researchers agree that more study is warranted (Astin, 1975, 1985; Noel et al., 1985; Ramist, 1981; Sexton, 1965; Snow, 1977; Tinto, 1975, 1987; Wilder, 1983). Sexton (1965) indicated that a 1958 report from the U.S. Office of Education showed more than a 50% dropout rate for students in higher education. More recent studies of dropout rates concur; Snow (1977) validated that the national estimate for students leaving before the end of the first semester was as high

as 50%. Given the declining numbers of the traditional age students, enrollment driven funding formulae, and the concern for equal opportunity, retention remains a major issue for higher education.

Sexton's Research (1965)

An historical study was undertaken by Virginia Sexton in 1965. She reviewed 25 years of student retention literature in her study, "Factors Contributing to Attrition in College Populations: Twenty-Five Years of Research." Citing Iffert (1955) and Weintraub and Salley (1945), Sexton stated that the most difficult year and prime time for dropout is during the freshman experience, and this dropout is usually based on academic factors. Quoting Shuman (1956) concerning several prognostic assumptions about dropouts, Sexton wrote that "frequent cuts, haphazard work, low grades, indifferent attitudes, and either social withdrawal or inordinate social activity" (p. 303) affect student retention.

Sexton examined two sets of categories that influence student retention. The first categories are intellectual and academic factors which include high school performance, college-entrance age, academic load, study habits, and participation in extracurricular activities. The second set is concerned with nonintellectual factors. Physical health, personality and emotional factors, motivational factors and underachievement, social factors, vocational choice, and employment were all examples of nonintellectual considerations influencing retention.

Sexton also found that the selection of the institution has an impact on whether or not students will be successful. Important characteristics of institutions relating to retention are whether the school is public or private, and accredited or nonaccredited. In addition, the selection of an appropriate school may depend on location, size, and mission of the institution.

In conclusion, Sexton pointed out conflicting evidence revealed during the 25-year period studied. She said that this 25-year period serves to emphasize the enormous complexity of the college dropout problem and the impossibility of developing universally applicable methods of prevention and cure.

Tinto's Research (1975)

In 1975, Vince Tinto reported the findings from one of the first major longitudinal studies of student retention in the literature. Tinto was critical of previous retention research because of failure to define the problem and inadequate theoretical/conceptual development. Therefore, he designed a comprehensive conceptual framework to organize his retention model. Tinto's model was longitudinal; he argued that dropout from college is "a longitudinal process of interactions between the individual and the academic and social systems of the college" (p. 94). Tinto referred to his retention model as a conceptual schema for dropout from college and it utilized a path analysis with longitudinal data (see Appendix D).

Tinto espoused that individual characteristics that promote student integration with their selected college are essential components in retaining students. For example, the first of Tinto's designated characteristics is academic integration. Academic integration has two components. The first component is structural (i.e., meeting academic standards); the second is normative (i.e., how strongly the student identifies with the norms of that academic system).

The second individual characteristic pertinent to students who remain in college is social integration. Social integration for college students occurs basically through peer group association, semi-formal extracurricular activities, and interaction with faculty and administrative personnel within the college. Successful interaction through the social integration process encourages students to persist in college and therefore strengthens retention efforts.

Other important individual characteristics for retention include past educational experiences and goal commitment. The former correlates high school achievement with college achievement, while the latter is the student's goal commitment which involves the student's desire and determination to complete a college education. Tinto stated that dropout is the outcome of a multi-dimensional process involving interaction between the individual and the institution, so it is not surprising that institutional characteristics such as resources, facilities, and structural arrangements have been shown to contribute to differential rates of attrition. In the final analysis, a whole array of institutional and individual characteristics may influence dropout.

Tinto stated that institutional size seems to correlate with dropout figures. Generally, smaller institutions have lower dropout rates than do larger institutions. However, Tinto cited Kamen (1971) who took exception to this generalization. Kamen found that larger institutions have lower dropout rates than smaller institutions.

Tinto suggested that there were a number of issues concerning retention in higher education that require further investigation. First, there is a need for more information regarding the relationship between race and dropout from higher education. Second, research needs to be conducted with urban institutions regarding the dropout problem. Third, future research needs to explore the question of student and faculty subcultures and how socialization affects persistence in college. Finally, Tinto indicated that further research should utilize the longitudinal rather than cross-sectional data. The longitudinal model allows tracking cohorts, which is more helpful in obtaining meaningful comparative analyses of institutional impact upon retention.

Astin's Research (1975)

According to the publisher's comments in Alexander Astin's 1975 book, *Preventing Students from Dropping Out,* this work was the first longitudinal, multi-institutional study of college dropouts. A survey was conducted nationwide of 41,356 undergraduates at 358 representative two-year and four-year collegiate institutions; four years later a follow-up survey was conducted. As previously indicated, the majority of research studies prior to Astin's work

concentrated on descriptions such as enumerating and classifying demographic information. Astin's research focused on those characteristics that predict dropout and how to minimize the number of dropouts. Astin admittedly pointed out that some higher education critics have justifiably applauded student dropout. However,

> Many decision-makers, students included, legitimately want to know more about how to increase students' chances of finishing college, whether this concern is based on the loss of talent, the waste of limited educational resources, or the vocational and personal setbacks that result from the student's impeded career development and futile expenditure of time and effort. (p. 1)

Astin criticized previous retention research because of its poor design. He strived to improve the design of his research by acute attention to the definition of dropout. Astin identified three different categories related to dropping out: students who drop out, persist, or "stop out." Astin defined the new category of "stop out" as "students who interrupt their undergraduate education for a relatively brief period and return to complete the degree" (p. 9).

Astin developed a questionnaire that was given to students to determine reasons for dropping out (see Appendix E). Students were requested to select no more than three reasons from the 12 provided with regard to dropout. The numbers in Astin's chart represent percentages. The most frequent reasons given for dropping out, according to Astin's survey, were boredom with courses, financial difficulties, dissatisfaction with requirements

or regulations, and change in career goals. However, Astin found that certain gender differences did occur; women gave family as the most important reason for dropping out, while that category was not as important for male dropouts. The "some other reason" category received a substantial response by students. (This category was used to denote personal or emotional problems.)

The results of Astin's study concur with major findings of studies reviewed by Summerskill (1962), with the exception of the major discrepancy, which was in the importance attributed to academic difficulties: only 22% of students in Astin's study, in contrast with a median of about 33% in the studies reviewed by Summerskill, cited poor academic performance as a reason for dropping out. Thus, for a combined review of studies, Astin (1975), Summerskill (1962), and Tinto (1975) have provided a comprehensive array of reasons why students drop out.

Astin devoted an entire chapter on impact of financial aid, effects of employment, residence and campus environment, characteristics of the college, matching the student and institution, and implications for decision making and research. Astin may have been the first retention researcher to focus on the study habits of students as a significant variable. He listed 26 variables associated with student study habits.

Astin's study supported the theory that student involvement is important in student retention. Astin stated that "a student's tendency to drop out of

college is inversely related to the degree of direct involvement in the academic and social life of the institution" (p. 176). Possible future research would include independent psychological measures of student involvement. Psychological measures could be highly predictive of dropout behavior and should correlate substantially with behavioral measures. Future research should also examine how different students (i.e., high-ability students, minority students, and male versus female students) manifest their involvement in different ways. Astin identified the possible value of dropping out as another area that should be considered important for future research.

Ramist's Research (1981)

A more recent major comprehensive study was conducted for the College Board in 1981 by Leonard Ramist. Ramist found that 30 to 40% of entering freshmen graduate in four years from their college of original entry. An additional 30 to 50% graduate after four years or eventually graduate from a different college, or both; the remaining 10 to 35% are dropouts who never receive a degree. The students' responses given in the College Board study for dropping out were: academic matters, financial difficulties, motivational problems, personal considerations, dissatisfaction with college, military service, full-time jobs, the expressed need for new practical, nonacademic experiences, and the lack of initial plans to obtain a degree.

Ramist provided definitions and discussions for the dropout categories in his study. Some of these are presented below.

According to Ramist, academic matters,

> . . . the most frequently cited category, include poor grades, boredom with courses, change in career goals, and inability to take desired courses or programs. These reasons are given most often by men, by those in technical institutes, by those with a poor high school record, by those who drop out late in the freshman year, and by those who later transfer to another college or return. These reasons are given least by those in teacher colleges or by those who drop out in the senior year. In contrasting Summerskill's (1962) summary of several older studies with more recent studies, there appears to be a shift of emphasis from poor grades to boredom with courses (Astin, 1975) and to the irrelevance of school work (Fetters, 1977). (p. 3)

Concerning the category of financial difficulties, Ramist stated:

> This second most frequently cited category is used primarily by minorities, women with a poor high school record, early dropouts, and temporary dropouts. It is used least by those in technical institutes or by women with a good high school record. Interestingly, counselors rate this category much lower in importance than do students. Student reports of financial difficulties could be partially due to the fact that financial reasons are more socially acceptable. (pp. 3-4)

The next category considered motivational problems:

> This category includes uncertainty about educational and occupational goals, lack of interest in studies, and inability or unwillingness to study. It is cited particularly by early and permanent dropouts, by academic dropouts, and by women with a poor high school record. It is rarely cited by women with a good high school record. The fact that it is cited most often by academic dropouts could mean that a lack of goal clarity contributes to low grades. (p. 4)

In describing the category of personal considerations, Ramist stated:

> This category includes emotional problems, problems of adjustment to college life, 'getting one's head together,'

> marriage, pregnancy, family responsibilities, and illness. Marriage is given as a reason most often by women and minorities. This category was cited least by those in technical institutes. Although students do not rate these reasons as high in importance, counselors indicate that socio-emotional problems were the most important reasons for attrition. (p. 4)

The final three categories discussed by Ramist were dissatisfaction with the college, military service, and full-time jobs. First, dissatisfaction with the college "includes dissatisfaction with the size, the social or academic environment, the regulations, etc. It was cited most often by early and permanent dropouts" (p. 4). Second, military service "has become somewhat dated, but may take on more importance if the draft is reinstated. It was cited by those who later re-enrolled" (p. 4). Last, full-time jobs were "the reason cited primarily by early dropouts and those in teacher colleges or two-year colleges" (p. 4).

Ramist organized retention programs into 15 major categories. The most frequently cited programs for retaining students were learning and academic support, advising, early warning systems, and new policies and structures within the institution that were concerned with meeting student needs.

Perhaps one of the more interesting points of Ramist's study was that college does appear to make a difference in the quality of graduates' lives. Ramist stated that college graduates, in general, are more optimistic, and have better opportunities, more job security, better working conditions, and higher job satisfaction. He also found that they take on more leadership roles

and make better citizens. Table 35 (Appendix F) is directly related to educational attainment as a retention variable.

Ramist concluded by cautioning the reader that the information associating many student and college characteristics with retention is not conclusive. He asserted that there are substantial differences among institutions, so it is important to begin by conducting a local institutional dropout study. The Educational Testing Service's (ETS) Admission Testing Program, the College Board, and the National Center for Higher Education Management Systems may be instrumental in helping individual institutions to develop a retention plan.

Smith's Research (1981)

Another comprehensive study of retention that examined the two- and four-year college student was performed in 1981 by Alan Smith. Smith's study was divided into nine major components: (a) higher education and the concern for attrition, (b) factors involved in student attrition, (c) demographic factors, (d) financial factors, (e) socio-economic status, (f) academic achievement, (g) stated reasons for withdrawal, (h) institution type and persistence, and (i) dropout theory.

The key findings of Smith's study were that financial considerations are important in their relationship to retention. The majority of both dropouts and persisters have been from the middle class socio-economically. Higher persistence was associated with students of higher socio-economic status.

According to Smith, even though the relationship to persistence is clouded, high school grade point average (GPA) and rank still appear to be the best predictors of college grades.

Summary of Retention Research

To summarize, there appeared to be a consensus among retention researchers that more study in this field was warranted (Astin, 1975, 1985; Noel et al., 1985; Ramist, 1981; Sexton, 1965; Snow, 1977; Tinto, 1975, 1987; Wilder, 1983). Furthermore, retention researchers see the need to conduct local studies (Astin, 1975; Ramist, 1981; Terenzini, 1980) because of substantial differences among institutions. The major criticisms of past retention studies include the failure to define the problem, inadequate theoretical and conceptual development and design, lack of information concerning race and dropout, and lack of longitudinal processing. A discrepancy was identified in the major findings on the importance of dropout attributed to low academic achievement (Astin, 1975; Summerskill, 1962). Astin found that 22% of the student dropout population leave school because of academic difficulties, while Summerskill found the number for this population to be 33%. Therefore, more research on student attrition attributed to academic difficulty would appear to be useful.

Sexton (1965) accented the freshman experience as the most afflicted, adverse, and fragile time in terms of student dropout. Astin (1975) and Tinto (1975) agreed with Sexton and deemed student involvement to be a powerful

mitigator of student dropout. Tinto suggested that individual characteristics that further student academic and social integration with their selected institutions are essential components in retaining students.

The general retention background information revealed that Astin (1975), Beal and Noel (1980), Cope and Hannah (1975), Maxwell (1979), Sexton (1965), Spady (1971), and Tinto (1975) provided a comprehensive review of student retention determinants. For example, Cope and Hannah's (1975) bibliography (found in their work, *Revolving College Doors*) contains more than 400 citations.

Academic Assistance Programs

Academic assistance programs are as diverse and complex as historical development information on retention studies. Academic assistance programs have interchangeable descriptors such as developmental education, basic skills education, variations of tutoring, academic adjustment, intervention programs, and individualized instruction. Therefore, this research review of academic assistance programs employs various descriptors.

Academic assistance programs for high-risk students may be traced back to "one of the first remedial courses for college students which was implemented in 1894, at Wellesley College" (Cross, 1979, p. 24). In the 1930s and 1940s, colleges most often attempted to assist high-risk students through reading or learning courses that were seen as developmental in content; that

is, the courses were offered as basic skills on a non-credit basis. By the 1950s and 1960s, administrators of academic assistance programs began to recognize the importance of affective as well as cognitive development. Programs provided counseling to assist with the development of attitudes, values, and motivations. The Civil Rights Movement of the 1960s provided the justification for equal opportunity for handicapped and socially, educationally, culturally, and economically disadvantaged students. The result of these experimental programs was further development of academic assistance programs that provided a more comprehensive array of student services.

One of the first major evaluations of the effectiveness of academic assistance programs was conducted by Tinto and Sherman (1974). The overall evaluation findings were not favorable to such programs. Tinto and Sherman expressed concern that previous intervention programs attempted to control their situation (in terms of evaluation), but in reality did a very poor job. A difficulty inherent in academic assistance program evaluation is that program participants take part voluntarily; therefore, unknown reasons for dropping out, reactivity of respondents to testing procedures, and low questionnaire and interview responses have darkened the majority of these program evaluations. To resolve this problem, Tinto and Sherman suggested an experimental design with randomization of program participants to treatment so that extraneous factors could be minimized. Tinto and Sherman,

citing Evans (1974) and Timpane (1970), stated, "Unfortunately, such controlled experiments have rarely been employed in social settings" (p. 13).

Evaluations based exclusively on IQ tests or achievement scores measured by a pretest/posttest gain score may indicate that a program has not been successful when, in reality, it has been. Tinto and Sherman (1974) made reference to St. John (1971) and Coleman et al. (1966), who have recognized the importance of non-cognitive perceptual learning in the process of educational attainment. Specifically, they found a person's self-concept and sense of control over their environment to be significant factors in school achievement. Tinto and Sherman stated that these factors have been virtually ignored in intervention programs even though the value of this information is of consequence.

Another criticism in academic assistance program evaluation, aside from lack of empiricism and appropriate design, is the method of evaluating programs in terms of cost effectiveness and continuation of services. Tinto and Sherman (1974) stated that objectivity in program evaluation regarding cost effectiveness and continuation of services is practically impossible because program practitioners feel that programs should continue "because it's the right thing to do" (p. 29).

The Higher Education Amendments of 1968 authorized intervention programs for retention of the disadvantaged student (i.e., educationally, culturally, economically, or handicapped). Special Services, within the federal

government's Title III Program, is an example of this type of intervention program. Special Services programs provide assistance such as basic skills, tutoring, counseling (i.e., career, personal, and academic), study skills, and college orientation. Tinto and Sherman (1974), citing Davis (1973), stated that from 1970 to 1971, over $10 million were appropriated for Special Services programs to support some 121 projects with nearly 30,000 disadvantaged students. Davis (1973) conducted an extensive evaluation of Special Services programs, with mixed results. The findings were that Special Services students did not achieve more, based on GPA measures, than did regularly admitted students, nor did they achieve more than disadvantaged students not enrolled in the program. However, Special Services did change students substantially in terms of desire and determination to succeed. These non-cognitive changes were believed to be responsible for higher graduation rates (i.e., 50%) among these students (Tinto & Sherman, 1974).

Tinto and Sherman's (1974) study indicated that since the 1950s many large-scale retention programs have been created. The purpose of these programs has been to equalize educational opportunity. The premise is that equal educational opportunity provides for increased social attainment. However, the question of access and equal opportunity is still a concern regarding retention in higher education. Certainly high dropout rates, such as 50% during the freshman year, are not an indication of equal opportunity in higher education. In 1976, UNESCO urged that "the most educationally

underprivileged groups should be given the highest priority" (Cross, 1983, p. 46). The Higher Education Amendments of 1968 recognized the need to assist disadvantaged students and authorized several categories for intervention programs (Tinto & Sherman, 1974).

According to Tinto and Sherman (1974), actually little is known about the long-term effects of academic assistance programs that profess to assist in student retention. Nevertheless, these programs are abundant. Some program examples are: New York City's Demonstration Guidance Project, Higher Horizons, Title I, Upward Bound, Educational Talent Search, College Bound, Project ABC, Summer Skills, Summer School Institutes, Gary Job Corps, Diagnostic Reading, Special Services, Educational Grants, SEEK, and the College Discovery and Development Project. While it appears that most of these programs have had an impact on attitudes, values, and motivations, the empirical data affecting the cognitive development of students are left in question. The more successful academic assistance programs seem to have been integrated within the organizational structure of the institution, which assists in negating a social stigma associated with the program.

After reviewing academic assistance programs aimed at student retention, Tinto and Sherman (1974) offered the following recommendations:

> (1) Future evaluation research should be planned as an integral and continuing part of ongoing intervention programs; (2) future evaluation research should include both single and multiple program evaluations in ways which permit longitudinal comparative analyses of program effectiveness; (3) future evaluation research

> should examine both cognitive and non-cognitive outcomes, intended and unintended consequences of intervention programs; (4) results of future evaluation research should be coordinated and made available through the development of a centralized evaluation research center; (5) future intervention programs should be expanded to include a wider, more representative sample of disadvantaged youth in education; (6) while funding for future intervention efforts should be increased, it should be done so in a manner which permits greater experimentation in the development, running, and evaluation of intervention programs; (7) future intervention programs should be based upon a variety of theoretical models of educational attainment which specify the longitudinal causal relationship between differing input, process, and output variables; and (8) future intervention programs should be functionally integrated into the academic and social mainstreams of the institutions with which they are associated. (pp. 76-82)

Brown, Wehe, Zunker, and Haslam (1971) conducted a research study supported by a grant from the Education Foundation of New York. The study identified 124 college freshmen as potential dropouts and provided these students with academic adjustment counseling by trained upper-classmen at Southwest Texas State University during the fall of 1967. An experimental design was used, and a control group of 111 students received no counseling. Matching of students who received academic counseling was done by age, gender, ACT scores, high school rank, and high school size. The experimental and control groups were compared in four areas: (a) pre-post counseling scores on the survey of study habits and attitudes, (b) pre-post counseling scores of the effective Study Test, (c) post-counseling scores on the Study Skill Survey, and (d) first semester grade point average. The

experimental group, who received the peer academic counseling, was found to score significantly higher on all four measures.

Brown et al. (1971) found that a survey of the research literature provided only a limited amount of information about the effectiveness of student-to-student or peer counseling for identified potential dropouts. Consequently, their study was designed to measure the effectiveness of student counselors who assisted with academic achievement and what effect they had on potential dropouts. In reporting the results of their study, Brown et al. (1971) stated that "student-to-student counseling designed to improve study skills, scholastic motivation, and academic achievement is a practical and productive means for aiding the student whose measured potential for successfully completing college is questionable" (p. 289).

Agan (1971) conducted a study at Hiram Scott College in Nebraska to determine the difference in academic achievement between tutored and non-tutored freshmen in lower level courses of biology, English, mathematics, and political science. High-risk students with a poorer quality of educational attainment comprised the group to receive tutoring. Each student received a 22-minute period of traditional one-to-one tutoring each week during the quarter. This study concluded that tutoring did not contribute sufficiently to establish a significant difference between tutored and non-tutored students. Agan suggested that on the basis of this study, an additional study measuring the outcome of tutoring would be appropriate.

A similar study with traditional one-to-one tutoring provided by peers was performed by Moore (1974) at Mississippi State University (MSU). The MSU study yielded no significant difference in achievement for students who received tutoring compared to those who did not receive tutoring. Seventy-two students participated in the study, and Moore recommended that additional studies be done with larger samples, unlimited amounts of one-to-one tutoring by peers, and careful control of tutoring that correlates with course content.

Mink (1977) conducted a study focusing on mastery and individualized instruction. She enumerated 11 assumptions about learners and instructors that are critical to the success of this particular academic assistance method:

> (1) Significant learning takes place when the student perceives the subject matter as relevant to her *[sic]* own purposes; (2) much significant learning is acquired through doing; (3) learning is facilitated when the student participates responsibly in the learning process; (4) self-initiated learning that involves the whole person--feelings as well as intellect--is the most lasting and pervasive; (5) independence, creativity, and self-evaluation are basic and evaluation by others is secondary; (6) the most socially useful knowledge in the modern world is learning how to learn and how to remain continuously open to the process of change; (7) the instructor/facilitator has much to do with setting the initial mood or climate of the group or class experience; (8) the facilitator helps to elicit and clarify the purposes of the individuals in the class as well as the more general purposes of the group; (9) the facilitator endeavors to organize and make easily available the widest possible range of resources for learning; (10) the facilitator regards herself *[sic]* as a flexible resource to be used by the group; and (11) in responding to expressions in the classroom group, the facilitator accepts both the intellectual content and the emotional attitudes, trying to

> give each aspect the approximate degree of emphasis that it has for the individual or the group. (pp. 53-54)

Mink (1977) used the Personalized Systematic Instruction Inventory (PSII) to help assess instructional practices. From the PSII evolved a learner-oriented instructional system which is appropriate for high-risk students. Mink indicated that the result of this program is a supercharged and highly effective learning environment capable of fostering the acquisition of complex knowledge and abilities and maintaining high standards of competence; however, the empirical data to support such conclusions are limited.

Kulik, Kulik, and Shwalb (1983) performed a meta-analytic synthesis of 60 academic assistance programs for high-risk students. They refuted the findings of Tinto and Sherman (1974). The study by Kulik et al. demonstrated that special college programs for high-risk students have had a positive effect upon students. Kulik et al. used three sources to collect data for their study: (a) *Comprehensive Dissertation Abstracts;* (b) ERIC, including *Research in Education* and *Current Index to Journals in Education*; and (c) *Psychological Abstracts.* Initially, 504 articles were identified; all but 60 of these were subsequently eliminated by the researchers' guidelines. The guidelines used in this elimination process were: (a) the study had to involve high-risk students determined by low test scores, low achievement in high school or college courses, or socio-economically disadvantaged status; (b) the study had to have measured outcomes by using control groups; and (c) the study had to be free from methodological flaws (e.g., treatment and control groups

had to have equivalent aptitudes). Additionally, the study contained information in two major areas: achievement and persistence. Achievement was measured by GPA, while persistence was measured by students initially enrolled who remained enrolled during the period under evaluation. A total of 57 of the 60 studies contained GPA measurements; in 44 of those 57, GPAs were higher for students in the special programs than for the control group students. Thirty of the 60 studies examined persistence of students in the special programs. In 21 of these, persistence was higher for students in special programs than for the students in the control groups; in five studies, persistence was higher for the control groups; and in four studies, persistence rates were the same for both groups (Kulik et al., 1983).

Kulik et al. (1983) stated that Tinto and Sherman (1974) attempted to draw general conclusions from specific programs which suffered from problems common to narrative review. "Such reviews are usually unsystematic in their selection of studies and subjective and idiosyncratic in their interpretations" (Kulik et al., 1983, p. 18). Kulik et al. used an alternative to narrative analysis referred to as "meta-analysis," or the analysis of analyses. This statistical process integrates the findings from a vast array of individual studies.

A promising intervention technique, which is an adaptation of the traditional one-to-one tutoring method known as Supplemental Instruction (SI), was first described in the literature by Blanc, DeBuhr, and Martin (1983). This

academic assistance program was found to be effective in addressing problems in student achievement and attrition at an urban institution, the University of Missouri-Kansas City, that had approximately 11,000 students. The student attrition rates for freshmen and sophomores averaged 40% during an academic year. The university learning center, in cooperation with the faculty from the arts and sciences department, designed this program as an initiative to be cost effective as well as successful in reducing the rate of student dropout.

In this study, group tutoring was used in high-risk courses (that is, those from which students frequently withdraw). A group leader was employed who scheduled tutoring sessions three or four times a week. Student attendance averaged 6.5 hours per semester. The group leader was presented as a student of the subject and assisted students in learning course concepts while at the same time striving to increase competency in reading, reasoning, and study skills (Blanc et al., 1983). (The theoretical basis for the SI program is discussed more extensively in Chapter 1.)

The empirical data for evaluating the Missouri study were measured by: "(1) between-group performance difference in entry-level arts and sciences courses, (2) student re-enrollment at the University in succeeding semesters, and (3) longitudinal shifts in grade distribution patterns" (Blanc et al., 1983, p. 80). The number of students enrolled in seven arts and sciences courses during the spring of 1980 was 746. The SI group represented 261 students

who attended one or more group tutoring sessions. Those electing not to attend the group tutoring session were further divided into: first, a motivational control group that represented 132 students who indicated a high interest in attending tutoring sessions but could not do so because of scheduling conflicts; and second, a non-SI group that represented 353 of all the other students.

The following differences were observed in the between-group performance data:

> Students utilizing SI services: (1) have entry data (high school class rank percentile and college entrance test scores) comparable to data of the motivational control group and lower than the other non-SI students; therefore, the groups appear equivalent in terms of prior academic achievement; (2) have significantly higher average semester GPA's than both non-SI groups ($p > 0.01$); (3) have significantly higher average course grades compared to both non-SI groups ($p < 0.01$); and (4) have considerably fewer D and F grades and withdrawal than either of the non-SI groups ($p > 0.05$). (Blanc et al., 1983, p. 84)

The level of significance at the 0.01 level is using a t-test and the level of significance at the 0.05 level is using a chi-square test.

The data for students re-enrolling at the university in succeeding semesters were collected and analyzed on the study's 746 students. These data showed that students who elected to participate in the group tutoring sessions re-enrolled at a higher rate than those who did not participate in the program. The re-enrollment data of this group for fall of 1980 showed that 77.4% of the students who participated in the program returned to school,

while 67.3% of the non-participants did not. The spring semester of 1981 was also tracked for this same group, and 73.2% of the program participants re-enrolled, while 60% of the non-participants chose not to re-enroll (Blanc et al., 1983).

Longitudinal shifts in grade distribution were not conducted within the original study. A limitation of the study was that the longitudinal comparison was conducted with an introductory economics class only. While the percentages of D and F grades and withdrawals were less for the students who participated in group tutoring when compared to those who chose not to participate, generalizations drawn in connection with the original study were limited (Blanc et al., 1983).

The impact of the group tutoring method was quantified by the differences in both student achievement and retention. However, Blanc et al. (1983) admit that there was considerable difficulty in assessing which factors contributed to the observed effects of this program. More research using a different design would assist in determining the factors that contribute to these observed effects.

This intervention technique, known as Supplemental Instruction (SI), has a broad pedagogical theory base which has adapted learning strategies from various theorists; an extensive review may be found in Martin et al.'s (1983) *Supplemental Instruction: A Model for Student Academic Support.* For

the purposes of this study, works of the major theorists (i.e., Jean Piaget, Benjamin Bloom, and Edgar Dale) were reviewed.

Piaget (1964) developed a comprehensive model of cognitive development (see Appendix G). The SI approach suggests that many students in college have not developed the abstract or formal operational reasoning skills that allow them to learn by simply listening and reading the text. Robert Blanc, a coauthor of the SI method, provided an example of this at the 1984 Western College Reading and Learning Association Conference in San Jose, California. Blanc (1984) stated that a typical example was a medical student with whom he had worked the previous year. The student took a multiple-choice test that he failed. Blanc reviewed the student's answers on the test to see if he could learn anything about the student's cognitive learning process. Blanc verbally re-questioned the student about concepts that had been missed on the exam. The student knew the information, but answered the multiple-choice questions on the exam incorrectly because of poor abstract or formal operational reasoning skills. The student could not make the connection between the question and the correct answer on the exam. Blanc explained that students have difficulty understanding concepts that involve control of variables and proportional relationships because they do not know or have never been taught to think with these reasoning skills. One of the essential tasks of an SI tutor is to help students develop these reasoning skills. The founders of SI postulate that this is best done by

relating the new concepts to information students already know and by demonstrating how the variables are being manipulated. Also, the originators of SI stipulate the importance of helping students perceive what they do and do not understand about a concept and to assist them in formulating the type of questions they need answered.

Benjamin Bloom's (1956) classic contribution to learning and teaching is embodied in the hierarchy of Bloom's Taxonomy (see Appendix H). Bloom's Taxonomy is utilized in the SI tutoring method since the SI founders believed, as Bloom did, that cognitive processes pass through a series of levels with each supporting the next higher level (see Martin et al., 1983, pp. 58-59). The cognitive levels are correlated with a series of verbs which indicate the activities that occur at each level. Bloom's Taxonomy is useful for establishing instructional objectives in reference to cognitive processes. This provides a common language for simplifying and structuring curricular objectives that may be similar. "Furthermore, Bloom's Taxonomy facilitates diagnoses of learning difficulties by providing clues to alternate levels and strategies for instruction" (Martin et al., 1983, p. 58). Frequently, students learn to function only at the lowest levels of comprehension such as memorization and recognition. In many instances, however, "college professors often require much higher performance at the application, analysis, and synthesis levels" (Martin et al., 1983, p. 58). The SI tutoring model is designed to assist students in making the transition by providing instruction in all cognitive skill levels.

The third and final learning theory utilized by the SI model is reflected in Edgar Dale's (1954) Cone of Experience (see Appendix I). Dale hypothesized that learning occurs progressively from concrete experiences (e.g., hands-on) to abstract symbology (e.g., verbal and visual symbols). The ground work for instruction consists of actual sensory experiences combined with meaningful interaction with the stimuli sources. "As learning progresses, primary sensory experiences are stored and categorized; learning continues to accumulate with each new experience that is not only added, but also related to previous experience" (Martin, 1983, p. 58). The categories, which have been given labels, are related to other categories and this process continues. Regarding new concepts, instruction must begin at the cone level where the student is proficient. Learning then can advance upward in the cone. If a new concept is introduced at a level higher than the student has reached, this concept, most likely, will not be learned by the student. Frequently, content in college courses is introduced at an abstract level. Blanc et al. (1983, p. 82) cited evidence that suggests that "50% of entering college freshmen have not attained reasoning skills at the abstract level, and students who appear to operate at the concrete or non-abstract level consistently have difficulty processing unfamiliar information when it is presented through the abstract media of lecture and text." Thus, students' questions about material are often detail-oriented and sketchy, which is consistent with their perceived need for memorization and recognition on a

cognitive level. Therefore, an SI tutor is trained to assist in the learning process by identifying the student's functional level with the subject matter. Next, the SI tutor structures assistance to review the material at the appropriate level and then progresses upward according to Edgar Dale's Cone of Experience.

Summary of Academic Assistance Research

Within the academic assistance program literature, there exist many discrepancies on measures of effectiveness. Some apparently successful academic assistance models not detailed in this review include Behrman, Dark, and Paul (1984); Dukes and Gaither (1984); Gallini, Campbell, and Hatch (1986); White (1984); and Wilder (1983). The more recent models appear to be more successful and their designers stress the need for further study, as did the originators of earlier programs. However, in spite of the discrepant findings and the overall paucity of academic assistance program research, academic assistance appears to be a vital link for student achievement and retention.

There appeared to be a consensus among retention researchers that more study in the field is essential. More specifically, there is a shortage of retention research conducted in a single-unit college setting that focuses on student achievement among high-risk groups, particularly with regard to race. Further, the research literature focusing on academic assistance programs is fraught with discrepant findings. Finally, the research conducted on the SI

method strongly suggests that a longitudinal study should be conducted which employs statistical analyses that would provide a more refined assessment of the many factors contributing to the effects of the program.

Retention continues to be an important issue in higher education and will remain so as long as the traditional high school graduate cohort decreases and equal opportunity is valued. Institutions of higher education that fail to develop effective academic assistance programs will find it difficult to offset the inevitable losses during times of financial exigency.

> Unless colleges and universities develop action programs designed to improve the holding power of their students, it is very possible that historians of education will look back and label the last two decades of the 20th century as the dark ages of modern higher education. (Wilder, 1983, p. 9)

CHAPTER 3

PROCEDURES AND METHODOLOGY

Introduction

This study was designed to examine the effectiveness of an academic assistance program by focusing on a project that was funded for Northern Montana College (NMC) by a $5,000 grant from the First Bank System. The purpose of this study was to determine whether there was a difference between the effectiveness of the Supplemental Instruction (SI) group tutoring method and the one-to-one tutoring method on student academic achievement and retention.

This chapter presents the specific procedures which were employed in the study. The subsections describing these procedures in this chapter are: a description of the population, general data collection procedures and method, treatment, randomization, pretest-posttest instrument and method, research design, variables for the factorial design, statistical hypotheses, precautions taken for accuracy, ethical standards, and summary.

Description of the Population

This study was conducted at Northern Montana College (NMC) in Havre, Montana, one of the six units of the Montana University System. The college has been charged by the Board of Regents with a three-faceted responsibility: technical studies, pre-professional studies, and teacher education. NMC, an open-admissions institution in higher education, has an enrollment of approximately 1,750 students. The mean age of the student population was approximately 29 years, which reflects a balance between students who were recent high school graduates and middle-aged adults who were re-entering education for the purpose of gaining or upgrading job skills. There were several one- and two-year vocational technical programs which prepared students for entry-level employment opportunities. In the past few years, attrition rates of freshmen students at NMC have been estimated to average between 53% and 60%; with enrollment-driven funding formulae, this has proven to be a critical loss.

The population for this particular study included English 150 students who were enrolled in the 1986-87 academic school year. English 150 was an introductory basic communications class. The course focused on sentence structure, parts of speech, grammar, usage, punctuation, and paragraph development. English 150 (or the equivalent competency level) was a prerequisite for English 151 which was required for all programs. Six sections

of English 150 were offered fall quarter, three were offered winter quarter, and two sections were offered spring quarter, with respective enrollments of 222 students originally and 21 students who repeated the course twice and two students who repeated the course three times. English 150 was a course designed for high-risk students; that is, students in the course had a deficiency in the competency level required for entry-level English courses at NMC. Criteria for enrollment in English 150 was determined by the Freshman English Placement Exam; additionally, the ACT was used to assist in appropriate placements for marginal students.

General Data Collection Environment

The data for this study were collected through the assistance of various departments at NMC which included the Learning Center (LC), the English department faculty, the registrar's office, and computer services. Functionally, the LC was known as the location where such services as instruction in basic skills, problem-solving, study skills, and counseling (i.e., academic, career, and personal) were available.

Treatment Methods Measured

The treatment for this study consisted of examining the effects of the two experimental tutoring methods implemented for a project at NMC. The first method was Supplemental Instruction (SI), which is a group tutoring method;

the second method was a one-to-one tutoring method. SI was taught to peer tutors at NMC by Dr. Larry DeBuhr, a co-designer of the method from the University of Missouri-Kansas City. In addition, peer tutors were given nine hours of training in study skills, reasoning skills, and reading skills which were utilized in the tutorial sessions within the content area. SI tutors attended the English 150 classes and conducted the tutorial sessions based on the SI learning approach.

In contrast to SI, the one-to-one tutoring primarily was directed by the student receiving tutoring; that is, the student decided what was important to study and what areas of the course content were problematic. The peer tutors who delivered the one-to-one instruction did not receive prior systematic training as did the SI tutors.

To standardize the qualifications, tutors (i.e., SI and one-to-one) were required to have a minimum of nine college credit hours of English in which they received grades of B or better and/or were nominated by the English department faculty. Adherence to LC policy of payment to tutors was $3.50 per hour for one-to-one tutors and $5.00 per hour for SI tutors.

Randomization

Kerlinger (1973) suggested randomizing whenever possible because this equalizes the groups in a statistical sense. Random selection of students to sections was not feasible during implementation of this project; however,

random assignment of sections to treatment was employed by picking section numbers "out of a hat" for a designated treatment. For this particular project, four sections received the SI treatment fall quarter, while two sections received the one-to-one treatment. During the winter quarter, two sections received the SI treatment and one section received the one-to-one treatment. During the spring quarter, one section received the SI treatment, while the other received the one-to-one treatment.

Pretest-Posttest Instrument and Method

A pretest-posttest instrument, the 1976 edition of Tests of Adult Basic Education (TABE), was administered to both the SI and one-to-one tutoring groups to measure the effectiveness of the treatments. The TABE measured student achievement in capitalization, punctuation, expression, and spelling. The pretest and posttest instructions, timing, and grading were identical for all groups.

The 1976 edition of TABE was a revision to the TABE of 1970, which was often referred to as the California Achievement Tests (CAT). The TABE has a 55-year history and is periodically updated and revised. According to the *Ninth Mental Measurement Yearbook* (Rogers, cited in Mitchell, 1985), parallel-form reliability is satisfactory in the TABE if the assumption is made that there is at least as much true score variance as error variance in a set of scores. The correlations for the parallel-form reliability exceed .71.

In referring to the TABE, Wilson (cited in Mitchell, 1985) stated, "This test is as good as any test available for its purpose as a norm-referenced multi-level basic skills test" (p. 246). He also stated, "Content review for ethnic and sex bias was extensive" (p. 248). Wilson's major criticism seemed to be that the TABE was touted as a norm-referenced as well as criterion-referenced test, when in actuality the TABE is not a criterion-referenced test but, in fact, only a good norm-referenced test. The other common criticism has been that the TABE was not originally normed for adults, but rather for youth.

Following the pretest, students received one of the treatments for 50 minutes twice a week for the remainder of the quarter, or approximately eight weeks. At the end of the quarter, students took the TABE posttest.

In addition, the TABE pretest-posttest scores were used to assist in measuring student achievement. The effectiveness of the treatment was also measured by student retention information. Data were collected on students enrolled in English 150. Course completion rates were recorded one year after treatment and then again two years after treatment.

Research Design

The investigation employed a pretest-posttest group design as depicted in Figure 1.

R	O	X_1	O	(the SI method)
R	O	X_2	O	(the one-to-one method)

KEY:

R = random assignment
O = observation, pretest or posttest
X_1 = experimental or unusual treatment (i.e., SI)
X_2 = traditional treatment (i.e., one-to-one)

Figure 1. Pretest-posttest group design.

Gay (1987) suggested that "ideally subjects should be randomly selected and randomly assigned; however, to qualify as a true experimental design, at least random assignment must be involved" (pp. 285-286). Gay stated that there are three basic ways that data can be analyzed to examine the effectiveness of the treatment. Further, he recommended that of these three ways, the best method may be simply to compare the scores of the two groups. This comparison may use a t-test as long as the pretest indicates that the two groups are basically the same on the dependent variable.

This study also employed a factorial design. Factorial derives its name from the idea that the design involves several factors.

> In Education, variables do not operate in isolation, so the purpose of a factorial design is to determine whether the effects of an experimental variable are generalizable across all levels of a control variable or whether the effects are specific to specific levels of the control variable. A factorial design can demonstrate relationships that a single-variable experiment cannot. (Gay, 1987, p. 321)

Factorial designs provide "methods for testing different subgroups, or various combinations of subgroups, and represent different populations in terms of what is being measured as the dependent variable" (Williams, 1979, p. 90).

Variables for the Factorial Design

The first independent variable, which was the treatment for this study, was SI and the one-to-one tutoring method. Additional independent variables were further broken down into student types of traditional and non-traditional; student gender, which was male and female; student prior educational attainment before entering college, which was formally graduating from high school, GED status, and adult special; student major, which was vocationally and non-vocationally designated; and student ethnicity, which was primarily Caucasian and Native American, with the exception of two Orientals. The dependent or criterion variables were achievement as measured by the posttest gain results and factors such as cost effectiveness of tutoring, and retention as measured by course completion rates.

Statistical Hypotheses

To suit the purpose of this study and to answer general questions involved, the following null hypotheses were tested:

(1) H_1: There will be no significant interaction between the independent variables of methods of tutoring and ethnicity of students on the dependent variable of achievement.

H_2: There will be no difference in student achievement between those using the Supplemental Instruction (SI) method of tutoring and the one-to-one method of tutoring.

H_3: There will be no difference in student achievement among those whose ethnicity is Native American, Caucasian, or Oriental.

(2) H_1: There will be no significant interaction between the independent variables of methods of tutoring and student gender on the dependent variable of achievement.

H_2: There will be no difference in student achievement between those using the SI method of tutoring and the one-to-one method of tutoring.

H_3: There will be no difference in student achievement between gender types of male and female.

(3) H_1: There will be no significant interaction between the independent variables of methods of tutoring and student type on the dependent variable of achievement.

H_2: There will be no difference in student achievement between those using the SI method of tutoring and the one-to-one method of tutoring.

H_3: There will be no difference in achievement between student types categorized as non-traditional or traditional.

(4) H_1: There will be no significant interaction between the independent variables of methods of tutoring and college major on the dependent variable of achievement.

H_2: There will be no difference in student achievement between those using the SI method of tutoring and the one-to-one method of tutoring.

H_3: There will be no difference in student achievement between college majors who are vocationally or non-vocationally designated.

(5) H_1: There will be no significant interaction between the independent variables of methods of tutoring and prior educational attainment.

H_2: There will be no difference in student achievement between those using the SI method of tutoring and the one-to-one method of tutoring.

H_3: There will be no difference in achievement between students who formally graduated from high school and those who did not formally graduate from high school.

(6) H_1: There will be no significant interaction between the independent variables of student ethnicity and student gender on the dependent variable of achievement.

H_2: There will be no difference in student achievement among those whose ethnicity is Native American, Caucasian, or Oriental.

H_3: There will be no difference in student achievement between gender types of male and female.

(7) H_1: There will be no significant interaction between the independent variables of student ethnicity and prior educational attainment on the dependent variable of achievement.

H_2: There will be no difference in student achievement among those whose ethnicity is Native American, Caucasian, or Oriental.

H_3: There will be no difference in achievement between students who formally graduated from high school and those who did not formally graduate from high school.

(8) H_1: There will be no significant interaction between the independent variables of student ethnicity and college major on the dependent variable of achievement.

H_2: There will be no difference in student achievement among those whose ethnicity is Native American, Caucasian, or Oriental.

H_3: There will be no difference in student achievement between college majors who are vocationally or non-vocationally designated.

(9) H_1: There will be no significant interaction between the independent variables of student ethnicity and student type (which consists of traditional and non-traditional students) on the dependent variable of achievement.

H_2: There will be no difference in student achievement among those whose ethnicity is Native American, Caucasian, or Oriental.

H_3: There will be no difference in achievement between student types categorized as traditional or non-traditional.

(10) H_0: Retention level is independent of the SI and one-to-one tutoring methods.

(11) H_0: Retention level is independent of student ethnicity (that is, Native American, Caucasian, and Oriental).

(12) H_0: Retention level is independent of student gender.

(13) H_0: Retention level is independent of prior educational attainment.

(14) H_0: Retention level is independent of college majors that are designated as vocational or non-vocational.

(15) H_0: Retention level is independent of student type (that is, traditional and non-traditional).

Statistical Procedures for Data Analyses

Ferguson (1981) stated that a common convention is for the researcher to select a particular level of significance when choosing at the .05 or .01

levels. The hypotheses of this study were tested at the .05 level of significance.

For the pretest-posttest group, initial group equivalencies were analyzed using a t-test to test the significance of the difference between the pretest means; an analysis of covariance would have been used if the means were not equivalent. Data on the posttest were analyzed with the two-way analysis of variance (ANOVA).

The factorial design was used to simultaneously investigate a number of factors. A series of two-way ANOVAs was employed for this purpose.

When the research data were in the form of frequency counts, the chi-square test was used (Borg & Gall, 1983). Chi-square was utilized to assist in determining whether the independent variables were significant in retention of students as measured by course completion rates subsequent to English 150.

Precautions Taken for Accuracy

All pretest-posttest scores were checked by the investigator and then validated by the director of Student Services. The investigator assisted the English department faculty in explaining the tutorial component of the course; the explanation was standardized by reading the same information to each class. The investigator administered all of the pretests and posttests for consistency. Data on sequential enrollment in English 151, 152, and 153, as

well as quarterly re-enrollment, were analyzed using course data base information; this information was subsequently rechecked by a first-hand inspection of student transcripts.

Ethical Standard

All students' pretest-posttest scores, course completion rates, birth-dates, and various other forms of personal information were kept confidential in accordance with accepted standards protecting privacy. A composite of group scores may be disclosed, but individual names associated with individual scores have not been disclosed. Also, all students at NMC, even those not involved in this study, were given tutoring for any course if so requested by the individual student.

Summary

This study examined the effectiveness of a project that was implemented by using two different tutoring methods at Northern Montana College. The population for the study included students enrolled in English 150 during the academic year of 1986-87. Students were pretested and posttested and received one of two possible tutoring treatments. The results of the study explored whether there was a difference between the effectiveness of the Supplemental Instruction (SI) group tutoring method and the traditional one-to-one tutoring method on student academic achievement and subsequent

retention. Not only should the findings of this study help to strengthen knowledge about academic assistance models that strive to increase student achievement, but should provide information about the relationship between academic achievement and retention.

CHAPTER 4

RESULTS AND FINDINGS

Introduction

This study was a comparative analysis which produced data that examined the effectiveness of two tutoring methods with regard to achievement and retention for high-risk undergraduate students at Northern Montana College (NMC). Achievement, for the purposes of this study, was defined as the amount of improvement measured by the pretest-posttest gain scores. Retention was defined as the number of student credits successfully completed with a grade of C (i.e., 2.0 or better on a 4.0 scale). This chapter begins with a description of the population of the study and concludes with the results from the testing of the statistical hypotheses.

Study Population

The population for this study included all English 150 students who were enrolled in the 1986-87 academic school year. The total initial enrollment was 222 students who were divided among 11 sections of English 150. Six sections were offered fall quarter, three were offered winter quarter, and two

were offered spring quarter. Sixteen students dropped the course within the first or second day of the onset of instruction. Another seven students dropped the course within the first two weeks of the quarter. An additional 11 students dropped the course during the first seven weeks. Finally, five more students dropped the course during the 7 to 10 week period of the quarter. Twenty-one students enrolled for the course and the tutoring method twice, and two students repeated the course and the tutoring treatment three times.

As stated earlier, English 150 was a course designed for high-risk students; that is, students who have a deficiency in the competency required for entry-level English courses at NMC. The competency level of each student in English was determined by a mandatory Freshman English placement exam administered prior to enrollment in the course. Subsequently, all students enrolled in English 150 were placed either in Supplemental Instruction (SI), which was a group tutoring method, or in one-to-one tutoring, which was a traditional treatment method to assist students with English 150. The determination as to which sections of English 150 received which treatment method was accomplished by randomly picking section numbers "out of a hat." Students were pretested and posttested with the Tests of Adult Basic Education (TABE); the number of students actually completing each instrument is provided in each table displaying the data collected.

Statistical Analyses

Initial group equivalence on the pretests was analyzed using an F-test for homogeneity of variance. The group means on the pretests were found to be equivalent. Analyses of variance were used for the first nine hypothesis sets and chi-square was used for examining hypotheses 10 through 15.

Hypotheses Examined by Analyses of Variance

Interactions and main effects of the first nine hypothesis sets were analyzed by a two-way analysis of variance statistical procedure. The significance of all analyses of variance was determined by an alpha level of .05. Analyses of variance are summarized in corresponding tables, starting with Tables 1 and 2 for the first set of hypotheses.

(1) H_1: There will be no significant interaction between the independent variables of methods of tutoring and ethnicity of students on the dependent variable of achievement.

H_2: There will be no difference in student achievement between those using the Supplemental Instruction (SI) method of tutoring and the one-to-one method of tutoring.

H_3: There will be no difference in student achievement among those whose ethnicity is Native American, Caucasian, or Oriental.

Analyses of variance for hypothesis set (1) are summarized in Table 2, from which the F scores were derived. A graphic display of cell means is presented in Table 1.

Table 1. Table of means of student achievement by method of tutoring and student ethnicity.

	TWO-WAY CELL MEANS					
	Student Ethnicity					
	Caucasian		Native American		Oriental	
Tutoring Method	No.	Mean	No.	Mean	No.	Mean
SI	88	1.45	21	1.14	1	1.20
One-to-One	39	1.16	10	1.39	0	0.00

Table 2. Two-way analysis of variance of student achievement by method of tutoring and student ethnicity.

Source of Variation	Sum of Squares	DF	Mean Square	F	Signif. of F
Main Effects	1.643	3	0.548	0.179	0.910
Tutoring method	1.145	1	1.145	0.375	0.541
Student ethnicity	0.497	2	0.249	0.081	0.922
2-Way Interactions	1.575	1	1.575	0.515	0.474
Tutoring Method x Ethnicity	1.575	1	1.575	0.515	0.474
Explained	3.219	4	0.805	0.263	0.901
Residual	470.775	154	3.057		
Total	473.993	158	3.000		

The F-value for hypothesis (1) H_1 was 0.515 with a p-value of 0.474. This indicated no two-way interactions existed between methods of tutoring (i.e.,

SI and one-to-one) and ethnicity of students (i.e., Native American, Caucasian, and Oriental) with regard to student achievement (i.e., the gain score measured by the pretest-posttest instrument). Main effects of hypothesis (1) H_2 gave an F-value of 0.375 with a p-value of 0.541. This suggested that there was no difference between methods of tutoring on student achievement. Main effects of hypothesis (1) H_3 gave an F-value of 0.081 with a p-value of 0.922. Consequently, there was no difference in student achievement based on student ethnicity.

Based on these findings, null hypotheses H_1, H_2, and H_3 of hypothesis set (1) were retained. It was deduced that there were no significant interactions or differences between methods of tutoring and student ethnicity on student achievement.

(2) H_1: There will be no significant interaction between the independent variables of methods of tutoring and student gender on the dependent variable of achievement.

H_2: There will be no difference in student achievement between those using the SI method of tutoring and the one-to-one method of tutoring.

H_3: There will be no difference in student achievement between gender types of male and female.

Analyses of variance for hypothesis set (2) are summarized in Table 4. A graphic display of cell means is presented in Table 3.

Table 3. Table of means of student achievement by method of tutoring and student gender.

Tutoring Method	TWO-WAY CELL MEANS			
	Student Gender			
	Male		Female	
	No.	Mean	No.	Mean
SI	63	1.53	47	1.20
One-to-One	34	1.17	15	1.28

Table 4. Two-way analysis of variance of student achievement by method of tutoring and student gender.

Source of Variation	Sum of Squares	DF	Mean Square	F	Signif. of F
Main Effects	2.703	2	1.351	0.446	0.641
Tutoring method	1.456	1	1.456	0.480	0.489
Student gender	1.556	1	1.556	0.513	0.475
2-Way Interactions	1.393	1	1.393	0.459	0.499
Tutoring Method x Gender	1.393	1	1.393	0.459	0.499
Explained	4.095	3	1.365	0.450	0.717
Residual	469.898	155	3.032		
Total	473.993	158	3.000		

The F-value for interaction was 0.459 with a p-value of 0.499. This indicated no two-way interactions existed in student achievement between methods of tutoring and student gender (i.e., male and female). Main effects of hypothesis (2) H_2 gave an F-value of 0.480 with a p-value of 0.489, suggesting that there was no difference between methods of tutoring on student achievement. Main effects of hypothesis (2) H_3 produced an F-value

of 0.513 with a p-value of 0.475. This indicated that there was no difference in student achievement based on the gender of students.

Based on these findings, null hypotheses H_1, H_2, and H_3 of hypothesis set (2) were retained. There were no significant interactions or differences between methods of tutoring and student gender on student achievement.

(3) H_1: There will be no significant interaction between the independent variables of methods of tutoring and student type on the dependent variable of achievement.

H_2: There will be no difference in student achievement between those using the SI method of tutoring and the one-to-one method of tutoring.

H_3: There will be no difference in achievement between student types categorized as traditional or non-traditional.

Analyses of variance for hypothesis set (3) are summarized in Table 6. A graphic display of cell means is presented in Table 5.

Table 5. Table of means of student achievement by method of tutoring and student type.

Tutoring Method	TWO-WAY CELL MEANS			
	Student Type			
	Traditional		Non-Traditional	
	No.	Mean	No.	Mean
SI	64	1.12	46	1.76
One-to-One	22	0.75	27	1.58

Table 6. Two-way analysis of variance of student achievement by method of tutoring and student type.

Source of Variation	Sum of Squares	DF	Mean Square	F	Signif. of F
Main Effects	20.165	2	10.082	3.446	0.034
Tutoring method	2.558	1	2.558	0.874	0.351
Student type	19.018	1	19.018	6.500	0.012
2-Way Interactions	0.291	1	0.291	0.099	0.753
Tutoring Meth x Student Type	0.291	1	0.291	0.099	0.753
Explained	20.455	3	6.818	2.330	0.077
Residual	453.538	155	2.926		
Total	473.993	158	3.000		

The F-value of interaction was 0.099 with a p-value of 0.753. This indicated no two-way interactions existed between methods of tutoring and student type (i.e., traditional and non-traditional) on student achievement. Main effects of hypothesis (3) H_2 gave an F-value of 0.874 with a p-value of 0.351. This suggested that there was no difference between methods of tutoring on student achievement. Main effects of hypothesis (3) H_3 gave an F-value of 6.500 with a p-value of 0.012. Therefore, there was a significant difference in student achievement based on a student's type (i.e., traditional and non-traditional), with non-traditional students scoring higher achievement gains.

Based on these findings, null hypotheses H_1 and H_2 of hypothesis set (3) were retained, which indicated no significant interactions or differences. However, null hypothesis (3) H_3 was rejected, since there was a significant

difference between a student's type (traditional or non-traditional) with regard to student achievement.

(4) H_1: There will be no significant interaction between the independent variables of methods of tutoring and college major on the dependent variable of achievement.

H_2: There will be no difference in student achievement between those using the SI method of tutoring and the one-to-one method of tutoring.

H_3: There will be no difference in student achievement between college majors who are vocationally or non-vocationally designated.

Analyses of variance for hypothesis set (4) are summarized in Table 8, from which the F scores were derived. A graphic display of cell means is presented in Table 7.

Table 7. Table of means of student achievement by method of tutoring and student major.

Tutoring Method	TWO-WAY CELL MEANS			
	Student Major			
	Vocational		Non-Vocational	
	No.	Mean	No.	Mean
SI	58	1.42	52	1.36
One-to-One	32	0.94	17	1.70

Table 8. Two-way analysis of variance of student achievement by method of tutoring and student major.

Source of Variation	Sum of Squares	DF	Mean Square	F	Signif. of F
Main Effects	2.317	2	1.159	0.385	0.681
Tutoring method	0.877	1	0.877	0.291	0.590
Student major	1.171	1	1.171	0.389	0.534
2-Way Interactions	5.281	1	5.281	1.755	0.187
Tutoring Method x Major	5.281	1	5.281	1.755	0.187
Explained	7.599	3	2.533	0.842	0.473
Residual	466.395	155	3.009		
Total	473.993	158	3.000		

The F-value of interaction was 1.755 with a p-value of 0.187. This indicated no two-way interactions existed between methods of tutoring and college major (i.e., vocational and non-vocational) on student achievement. Main effects of hypothesis (4) H_2 gave an F-value of 0.291 with a p-value of 0.590. This indicated that there was no difference in student achievement based on the methods of tutoring. Main effects of hypothesis (4) H_3 gave an F-value of 0.389 with a p-value of 0.534, demonstrating that there was no difference in student achievement based on college major (i.e., vocational and non-vocational).

Based on these findings, null hypotheses H_1, H_2, and H_3 of hypothesis set (4) were retained. There were no significant interactions or differences between methods of tutoring and college major on student achievement.

(5) H_1: There will be no significant interaction between the independent variables of methods of tutoring and prior educational attainment.

H_2: There will be no difference in student achievement between those using the SI method of tutoring and the one-to-one method of tutoring.

H_3: There will be no difference in achievement between students who formally graduated from high school and those who did not formally graduate from high school.

Analyses of variance for hypothesis set (5) are summarized in Table 10, from which the F scores were derived. A graphic display of cell means is presented in Table 9.

Table 9. Table of means of student achievement by method of tutoring and prior educational attainment.

	TWO-WAY CELL MEANS					
	Prior Educational Attainment					
	H.S. Graduate		G.E.D.		Adult Special	
Tutoring Method	No.	Mean	No.	Mean	No.	Mean
SI	92	1.37	16	1.50	2	1.25
One-to-One	43	1.24	6	0.95	0	0.00

Table 10. Two-way analysis of variance of student achievement by method of tutoring and prior educational attainment.

Source of Variation	Sum of Squares	DF	Mean Square	F	Signif. of F
Main Effects	1.188	3	0.396	0.129	0.943
Tutoring method	1.168	1	1.168	0.381	0.538
Prior educational attainment	0.042	2	0.021	0.007	0.993
2-Way Interactions	0.663	1	0.663	0.216	0.642
Tutoring Meth x Edn Attainment	0.663	1	0.663	0.216	0.642
Explained	1.851	4	0.463	0.151	0.962
Residual	472.142	154	3.066		
Total	473.993	158	3.000		

The F-value of interaction was 0.216 with a p-value of 0.642. This indicated no two-way interactions existed between methods of tutoring and prior educational attainment on achievement. Main effects of hypothesis (5) H_2 gave an F-value of 0.381 with a p-value of 0.538. This suggested there was no difference between methods of tutoring on student achievement. Main effects of hypothesis (5) H_3 gave an F-value of 0.007 with a p-value of 0.993, indicating no difference in student achievement based on prior educational attainment.

Based on these findings, null hypotheses H_1, H_2, and H_3 of hypothesis set (5) were retained. There were no significant interactions or differences between methods of tutoring and prior educational attainment on achievement.

(6) H_1: There will be no significant interaction between the independent variables of student ethnicity and student gender on the dependent variable of achievement.

H_2: There will be no difference in student achievement among those whose ethnicity is Native American, Caucasian, or Oriental.

H_3: There will be no difference in student achievement between gender types of male and female.

Analyses of variance for hypothesis set (6) are summarized in Table 12, from which the F scores were derived. A graphic display of cell means can be found in Table 11.

The F-value of interaction was 0.047 with a p-value of 0.829. This indicated no two-way interactions existed between student ethnicity (i.e., Caucasian, Native American, and Oriental) and student gender (i.e., male and female) with regard to student achievement. Main effects of hypothesis (6) H_2 gave an F-value of 0.028 and a p-value of 0.972. This indicated that there was no difference in student achievement based on student ethnicity. Main effects of hypothesis (6) H_3 gave an F-value of 0.301 with a p-value of 0.584, suggesting that there was no difference between a student's gender on student achievement.

Based on these findings, null hypotheses H_1, H_2, and H_3 of hypothesis set (6) were retained. There were no significant interactions or differences between student ethnicity and gender on student achievement.

Table 11. Table of means of student achievement by student ethnicity and student gender.

Student Ethnicity	TWO-WAY CELL MEANS			
	Student Gender			
	Male		Female	
	No.	Mean	No.	Mean
Caucasian	86	1.42	41	1.23
Native American	11	1.25	20	1.21
Oriental	0	0.00	1	1.20

Table 12. Two-way analysis of variance of student achievement by student ethnicity and student gender.

Source of Variation	Sum of Squares	DF	Mean Square	F	Signif. of F
Main Effects	1.420	3	0.473	0.154	0.927
Student ethnicity	0.174	2	0.087	0.028	0.972
Student gender	0.922	1	0.922	0.301	0.584
2-Way Interactions	0.144	1	0.144	0.047	0.829
Ethnicity x Gender	0.144	1	0.144	0.047	0.829
Explained	1.564	4	0.391	0.127	0.972
Residual	472.429	154	3.068		
Total	473.993	158	3.000		

(7) H_1: There will be no significant interaction between the independent variables of student ethnicity and prior educational attainment on the dependent variable of achievement.

H_2: There will be no difference in student achievement among those whose ethnicity is Native American, Caucasian, or Oriental.

H_3: There will be no difference in achievement between students who formally graduated from high school and those who did not formally graduate from high school.

Analyses of variance for hypothesis set (7) are summarized in Table 14. A graphic display of the cell means can be found in Table 13.

Table 13. Table of means of student achievement by student ethnicity and prior educational attainment.

Student Ethnicity	TWO-WAY CELL MEANS					
	Prior Educational Attainment					
	H.S. Graduate		G.E.D.		Adult Special	
	No.	Mean	No.	Mean	No.	Mean
Caucasian	115	1.33	11	1.73	1	0.70
Native American	19	1.34	11	0.97	1	1.80
Oriental	1	1.20	0	0.00	0	0.00

Table 14. Two-way analysis of variance of student achievement by student ethnicity and prior educational attainment.

Source of Variation	Sum of Squares	DF	Mean Square	F	Signif. of F
Main Effects	0.595	4	0.149	0.048	0.996
Student ethnicity	0.574	2	0.287	0.093	0.911
Prior educational attainment	0.096	2	0.048	0.016	0.985
2-Way Interactions	3.180	2	1.590	0.514	0.599
Ethnicity x Edn Attainment	3.180	2	1.590	0.514	0.599
Explained	3.775	6	0.629	0.203	0.975
Residual	470.219	152	3.094		
Total	473.993	158	3.000		

The F-value of interaction was 0.514 with a p-value of 0.599. This indicated no two-way interactions existed between student ethnicity and prior educational attainment with regard to student achievement. Main effects of hypothesis (7) H_2 gave an F-value of 0.093 with a p-value of 0.911. This suggested that there was no difference in student achievement based on student ethnicity. Main effects of hypothesis (7) H_3 gave an F-value of 0.016 and a p-value of 0.985. Therefore, there was no difference in student achievement based on a student's prior educational attainment.

Based on these findings, null hypotheses H_1, H_2, and H_3 of hypothesis set (7) were retained. There were no significant interactions or differences between student ethnicity and prior educational attainment on student achievement.

(8) H_1: There will be no significant interaction between the independent variables of student ethnicity and college major on the dependent variable of achievement.

H_2: There will be no difference in student achievement among those whose ethnicity is Native American, Caucasian, or Oriental.

H_3: There will be no difference in student achievement between college majors who are vocationally or non-vocationally designated.

Analyses of variance for hypothesis set (8) are summarized in Table 16, from which the F scores were derived. A graphic display of cell means is presented in Table 15.

Table 15. Table of means of student achievement by student ethnicity and student major.

Student Ethnicity	TWO-WAY CELL MEANS			
	Student Major			
	Vocational		Non-Vocational	
	No.	Mean	No.	Mean
Caucasian	76	1.26	51	1.51
Native American	13	1.18	18	1.26
Oriental	1	1.20	0	0.00

Table 16. Two-way analysis of variance of student achievement by student ethnicity and student major.

Source of Variation	Sum of Squares	DF	Mean Square	F	Signif. of F
Main Effects	2.205	3	0.735	0.240	0.868
Student ethnicity	0.765	2	0.383	0.125	0.883
Student major	1.707	1	1.707	0.557	0.456
2-Way Interactions	0.167	1	0.167	0.054	0.816
Ethnicity x Major	0.167	1	0.167	0.054	0.816
Explained	2.372	4	0.593	0.194	0.941
Residual	471.621	154	3.062		
Total	473.993	158	3.000		

The F-value of interaction was 0.054 with a p-value of 0.816. This indicated no two-way interactions existed between student ethnicity and college majors with regard to student achievement. Main effects of hypothesis (8) H_2 gave an F-value of 0.125 with a p-value of 0.883, indicating no difference in student achievement based on student ethnicity. Main effects

of hypothesis (8) H_3 gave an F-value of 0.557 with a p-value of 0.456. This suggested there was no difference in student achievement based on college major (i.e., vocational and non-vocational).

Based on these findings, null hypotheses H_1, H_2, and H_3 of hypothesis set (8) were retained. There were no significant interactions or differences between student ethnicity and college majors with regard to student achievement.

(9) H_1: There will be no significant interaction between the independent variables of student ethnicity and student type (which consists of traditional and non-traditional students) on the dependent variable of achievement.

H_2: There will be no difference in student achievement among those whose ethnicity is Native American, Caucasian, or Oriental.

H_3: There will be no difference in achievement between student types categorized as traditional or non-traditional.

Analyses of variance for hypothesis set (9) are summarized in Table 18, from which the F scores were derived. A graphic display of cell means is presented in Table 17.

The F-value of interaction was 2.093 with a p-value of 0.150. This indicated no two-way interactions existed between student ethnicity and student type (i.e., traditional and non-traditional) with regard to student achievement. Main effects of hypothesis (9) H_2 gave an F-value of 0.301 and

a p-value of 0.741. This indicated that there was no difference in student achievement based on student ethnicity. Main effects of hypothesis (9) H_3 gave an F-value of 6.475 with a p-value of 0.012, indicating that there was a significant difference in student achievement based on student type (i.e., traditional and non-traditional).

Table 17. Table of means of student achievement by student ethnicity and student type.

Student Ethnicity	TWO-WAY CELL MEANS			
	Student Type			
	Traditional		Non-Traditional	
	No.	Mean	No.	Mean
Caucasian	73	0.98	54	1.88
Native American	13	1.28	18	1.18
Oriental	0	0.00	1	1.20

Table 18. Two-way analysis of variance of student achievement by student ethnicity and student type.

Source of Variation	Sum of Squares	DF	Mean Square	F	Signif. of F
Main Effects	19.358	3	6.453	2.215	0.089
Student ethnicity	1.751	2	0.876	0.301	0.741
Student type	18.860	1	18.860	6.475	0.012
2-Way Interactions	6.095	1	6.095	2.093	0.150
Ethnicity x Type	6.095	1	6.095	2.093	0.150
Explained	25.453	4	6.363	2.185	0.073
Residual	448.540	154	2.913		
Total	473.993	158	3.000		

Based on these findings, null hypotheses (9) H_1 and H_2 were retained. However, null hypothesis (9) H_3 was rejected since there was a significant difference in student achievement based on a student's type (i.e., traditional and non-traditional).

Hypotheses Examined by the Chi-Square Test of Independence

Hypotheses 10 through 15 were examined by the Chi-Square Test of Independence. The .05 level of significance was used for retaining or rejecting the null hypotheses. Retention for students in the study was defined as the number of hours successfully completed with a grade of C or better (i.e., 2.0 or better on a 4.0 scale). A ratio was calculated to determine the number of hours earned compared to the number of hours attempted since many students in the population were attending school part-time. The final retention value was the ratio percentage of the number of hours earned compared to the number of hours attempted. For example, a low retention value was 0% to 33.5%, a medium retention value was 33.6% to 66.5%, and a high retention value was 66.6% to 100%. Retention was examined for one year including the treatment quarter, and then again after the second year when treatment was completed. Therefore, each hypothesis was tested twice, once during the first year and again after the completion of the second year.

(10) H_0: Retention level is independent of the SI and one-to-one tutoring methods.

Tables 19 and 20 present the chi-square test results relative to retention level and tutoring methods for the first and second years following treatment, respectively.

Table 19. Chi-square test for tutoring method by retention level (i.e., low, medium, and high) for the first year following treatment.

RETENTION LEVEL	TUTORING METHOD	
	S I	One-to-One
LOW	23.2 17	11.8 18
MEDIUM	21.2 25	10.8 7
HIGH	83.6 86	42.4 40
Chi-Square = 7.14363 DF = 2 Level of Signif = 0.0281		

Table 20. Chi-square test for tutoring method by retention level (i.e., low, medium, and high) for the second year following treatment.

RETENTION LEVEL	TUTORING METHOD	
	S I	One-to-One
LOW	4.6 1	2.4 6
MEDIUM	3.9 5	2.1 1
HIGH	51.4 54	27.5 25
Chi-Square = 9.21554 DF = 2 Level of Signif = 0.0100		

As presented in Table 19, chi-square for the first year following treatment was 7.14363 with two degrees of freedom and a significance level of 0.0281. Therefore, the null hypothesis was rejected, since retention was not independent of the tutoring methods following the first year after treatment.

Table 20 summarized chi-square for the second academic year following treatment. Chi-square was 9.21554 with two degrees of freedom and a significance level of 0.0100. Therefore, the null hypothesis was rejected, since retention was not independent of the tutoring methods following the second year after treatment.

The findings for the observed and expected frequencies were grouped similarly for the first and second years following treatment. That is, the one-to-one tutoring method results indicated a greater number than expected for the low retention group, while the medium and high retention groups had fewer numbers than were expected. However, the SI tutoring method resulted in fewer numbers than expected in the low retention group, while reflecting an increase in the numbers expected for the medium and high retention groups.

(11) H_0: Retention level is independent of student ethnicity (that is, Native American, Caucasian, and Oriental).

Tables 21 and 22 present the chi-square test results relative to retention level and ethnicity for the first and second years following treatment, respectively.

Table 21. Chi-square test for ethnicity by retention level (i.e., low, medium, and high) for the first year following treatment.

RETENTION LEVEL	ETHNICITY		
	Caucasion	Native American	Oriental
LOW	26.3 16	8.3 18	0.4 1
MEDIUM	24.0 24	7.6 8	0.3 0
HIGH	94.7 105	30.0 20	1.3 1
Chi-Square = 21.23331 DF = 4 Level of Signif = 0.0003			

Table 22. Chi-square test for ethnicity by retention level (i.e., low, medium, and high) for the second year following treatment.

RETENTION LEVEL	ETHNICITY		
	Caucasion	Native American	Oriental
LOW	5.8 2	1.1 4	0.2 1
MEDIUM	5.0 6	0.9 0	0.1 0
HIGH	65.3 68	12.0 10	1.7 1
Chi-Square = 17.30136 DF = 4 Level of Signif = 0.0017			

Chi-square was summarized by Tables 21 and 22, from which the following scores were derived. Chi-square for the first year following treatment was 21.23331 with four degrees of freedom and a significance level of 0.0003. Student retention for the first year following treatment was not independent of student ethnicity. Therefore, the null hypothesis was rejected. The Native American student outcomes indicated a greater number than expected for the low and medium retention groups, while the high retention group had fewer numbers than were expected. However, the Caucasian student outcome indicated fewer numbers than expected in the low retention group, an equal number observed as expected in the medium retention group, and a greater number than expected for the high retention group.

Chi-square for the second year following treatment was 17.30136 with four degrees of freedom and a significance level of 0.0017. Student retention for the second year following treatment was not independent of student ethnicity. Therefore, the null hypothesis was rejected. The Native American student outcome had a greater number than expected in the low retention group, while the medium and high retention groups had fewer numbers than were expected. However, the Caucasian student outcome had fewer numbers than expected in the low retention group and greater numbers than expected in the medium and high retention groups.

(12) H_0: Retention level is independent of student gender.

Tables 23 and 24 present the chi-square test results relative to retention level and student gender for the first and second years following treatment, respectively.

Table 23. Chi-square test for student gender by retention level (i.e., low, medium, and high) for the first year following treatment.

RETENTION LEVEL	STUDENT GENDER	
	Male	Female
LOW	20.7 16	14.3 19
MEDIUM	18.9 22	13.1 10
HIGH	74.4 76	51.6 50
Chi-Square = 3.90344 DF = 2 Level of Signif = 0.1420		

Table 24. Chi-square test for student gender by retention level (i.e., low, medium, and high) for the second year following treatment.

RETENTION LEVEL	STUDENT GENDER	
	Male	Female
LOW	4.4 6	2.6 1
MEDIUM	3.8 4	2.2 2
HIGH	49.8 48	29.2 31
Chi-Square = 1.75488 DF = 2 Level of Signif = 0.4158		

Chi-square was summarized by Tables 23 and 24, from which the following scores were derived. Chi-square for the first year following treatment was 3.90344 with two degrees of freedom and a significance level of 0.1420. Student retention for the first year following treatment was independent of gender. Therefore, the null hypothesis was retained.

Chi-square for the second year following treatment was 1.75488 with two degrees of freedom and a significance level of 0.4158. Student retention for the second year following treatment was independent of gender. Therefore, the null hypothesis was retained.

(13) H_0: Retention level is independent of prior educational attainment.

Tables 25 and 26 present the chi-square test results relative to retention level and prior educational attainment for the first and second years following treatment, respectively.

Table 25. Chi-square test for prior educational attainment by retention level (i.e., low, medium, and high) for the first year following treatment.

RETENTION LEVEL	PRIOR EDUCATIONAL ATTAINMENT		
	H.S. Graduate	G.E.D.	Adult Special
LOW	28.8 23	5.3 11	0.9 1
MEDIUM	26.4 26	4.8 6	0.8 0
HIGH	103.8 110	18.9 12	3.3 4
Chi-Square = 11.66071 DF = 4 Level of Signif = 0.0201			

Table 26. Chi-square test for prior educational attainment by retention level (i.e., low, medium, and high) for the second year following treatment.

RETENTION LEVEL	PRIOR EDUCATIONAL ATTAINMENT		
	H.S. Graduate	G.E.D.	Adult Special
LOW	5.9 4	1.0 3	0.1 0
MEDIUM	5.1 3	0.8 3	0.1 0
HIGH	67.0 71	11.2 7	0.9 1
Chi-Square = 12.99675 DF = 4 Level of Signif = 0.0113			

Chi-square was summarized by Tables 25 and 26, from which the following scores were derived. Chi-square for the first year following treatment was 11.66071 with four degrees of freedom and a significance level of 0.0201. Student retention for the first year following treatment was not independent of prior educational attainment. Therefore, the null hypothesis was rejected. The adult special student population was small, which may have been why the results indicated only slightly larger numbers than were expected for the low and high retention groups. The medium retention group was slightly smaller than the number expected. The G.E.D. student results indicated greater numbers than expected in the low and medium retention groups, while the high retention group had a lower number than was expected. The high school graduate results indicated a lower number than

expected for the low retention group. The medium retention group was almost equal in the numbers expected and observed. The high retention group had a greater number than was expected.

Chi-square for the second year following treatment was 12.99675 with four degrees of freedom and a significance level of 0.0113. Student retention the second year following treatment was not independent of prior educational attainment. Therefore, the null hypothesis was rejected. The adult special student results indicated a very slight decrease in the number expected for the low and medium retention groups. The high retention group had an increase in the number expected. The G.E.D. student results indicated an increase in the number expected in the low and medium retention groups, while the high retention group had a decrease in the number expected. The high school graduate results indicated a decrease in the number expected in the low and medium retention groups, while the high retention group had an increase in the number expected.

(14) H_0: Retention level is independent of college majors that are designated as vocational or non-vocational.

Tables 27 and 28 present the chi-square test results relative to retention level and college majors (vocational or non-vocational) for the first and second years following treatment, respectively.

Table 27. Chi-square test for college majors by retention level (i.e., low, medium, and high) for the first year following treatment.

RETENTION LEVEL	COLLEGE MAJOR	
	Vocational	Non-Vocational
LOW	20.7 22	14.3 13
MEDIUM	18.9 19	13.1 13
HIGH	74.4 73	51.6 53
Chi-Square = 0.27581 DF = 2 Level of Signif = 0.8712		

Table 28. Chi-square test for college majors by retention level (i.e., low, medium, and high) for the second year following treatment.

RETENTION LEVEL	COLLEGE MAJOR	
	Vocational	Non-Vocational
LOW	4.7 5	2.3 2
MEDIUM	4.0 3	2.0 3
HIGH	53.2 54	25.8 25
Chi-Square = 0.91107 DF = 2 Level of Signif = 0.6341		

Chi-square was summarized by Tables 27 and 28, from which the following scores were derived. Chi-square for the first year following treatment was 0.27581 with two degrees of freedom and a significance level of 0.8712. Student retention for the first year following treatment was independent of college majors that are designated as vocational and non-vocational. Therefore, the null hypothesis was retained.

Chi-square for the second year following treatment was 0.91107 with two degrees of freedom and a significance level of 0.6341. Student retention for the second year following treatment was independent of college majors that were designated as vocational and non-vocational. Therefore, the null hypothesis was retained. The outcome for vocational majors indicated greater numbers than expected in the low and high retention groups, while the medium retention group had a lower number than was expected. The outcome for the non-vocational majors indicated slightly smaller numbers than were expected in the low and high retention groups. The medium retention group had a slightly larger number than was expected.

(15) H_0: Retention level is independent of student type (that is, traditional and non-traditional).

Tables 29 and 30 present the chi-square test results relative to retention level and student type (traditional and non-traditional) for the first and second years following treatment, respectively.

Table 29. Chi-square test for student type by retention level (i.e., low, medium, and high) for the first year following treatment.

RETENTION LEVEL	STUDENT TYPE	
	Traditional	Non-Traditional
LOW	18.9 14	16.1 21
MEDIUM	17.2 23	14.8 9
HIGH	67.9 67	58.1 59
Chi-Square = 6.90887 DF = 2 Level of Signif = 0.0316		

Table 30. Chi-square test for student type by retention level (i.e., low, medium, and high) for the second year following treatment.

RETENTION LEVEL	STUDENT TYPE	
	Traditional	Non-Traditional
LOW	4.0 5	3.0 2
MEDIUM	3.5 3	2.5 3
HIGH	45.5 45	33.5 34
Chi-Square = 0.70321 DF = 2 Level of Signif = 0.7036		

Chi-square was summarized by Tables 29 and 30, from which the following scores were derived. Chi-square for the first year following treatment was 6.90887 with two degrees of freedom and a significance level of 0.0316. Student retention for the first year following treatment was not independent of student type. Therefore, the null hypothesis was rejected. The non-traditional student outcome indicated greater numbers than expected in the low and high retention groups, while the medium retention group had a smaller number than was expected. However, the traditional student outcome indicated a lower number than expected in the low retention group, while the medium retention group had a larger number than expected. The high retention group had only a slight decrease in the number expected.

Chi-square for the second year following treatment was 0.70321 with two degrees of freedom and a significance level of 0.7036. Student retention for the second year following treatment was independent of student type. Therefore, the null hypothesis was retained.

Examination of General Questions

A more general question for the purpose of this study concerned the cost effectiveness of the treatment. This question was not originally framed as an hypothesis, but nevertheless is posed and may be best examined by a statistical t-test.

The first step in investigating cost effectiveness was to determine the total treatment cost of each tutoring method. The total treatment cost of the

Supplemental Instruction (SI) group was calculated by multiplying the number of treatment sessions by a proportion which gives the cost per one treatment session, divided by the mean number of students in each treatment session. A graphic representation of this calculation is shown below:

Number of Treatment Sessions x $5.00 ÷ 5.333

The total treatment cost for the one-to-one tutoring group was calculated by multiplying the number of treatment sessions by a proportion which gives the cost per one treatment session. A graphic representation of this calculation is shown below:

Number of Treatment Sessions x $3.50

Finally, the cost per one grade level of improvement was calculated to examine the question of cost effectiveness between the two treatment groups. The cost of one grade level of improvement was the total treatment cost divided by the mean gain score. The following t-test results, which are presented in Table 31, show the comparison between the SI group and the one-to-one group.

Table 31. Cost comparison of SI and one-to-one tutoring methods.

Cost per grade >	N	Mean	SD	F-Value	P-Value
SI	133	$ 3.4632	5.338	61.50	0.001
One-to-One	73	$16.2948	41.863		

As shown in Table 31, the average cost per one grade level of improvement was approximately $3.46 for the SI method of tutoring, while the cost for the one-to-one method of tutoring was approximately $16.30. Therefore, there was a statistically significant difference on the t-test for the average cost per one grade level of improvement between the SI and the one-to-one groups, since the p-value was found at the 0.001 level.

Another general question was concerned with whether the tutoring methods made a difference in student achievement. A t-test was utilized to compare the total pretest-posttest gain scores. This t-test resulted in a mean score of 9.6193 (i.e., grade equivalency) for the pretest and a mean score of 10.8075 (i.e., grade equivalency) for the posttest. The p-value was found significant at the 0.000 level. This lends supporting evidence that the treatment did make a difference.

Summary

Much of Chapter 4 has been presented in tabular form to answer nine sets of hypotheses (i.e., 1 through 9) and the answers for six additional hypotheses (i.e., 10 through 15) with statistical analyses for two separate years. Chapter 4 also described a t-test in conjunction with a mathematical formula that examined the question of cost effectiveness between treatment groups. A t-test lending evidence for the effectiveness of treatment as a total group was also discussed. This chapter concludes with a summary table (Table 32) which indicates which of the 39 total null hypotheses were retained

or rejected. Detailed statements on the hypotheses and supporting analyses have been presented earlier in this chapter.

Table 32. Summary table of null hypotheses and status of retention or rejection.

No.	NULL HYPOTHESIS STATEMENTS	Retained	Rejected
1.	H_1: There will be no significant interaction between the independent variables of methods of tutoring and ethnicity of students on the dependent variable of achievement.	X	
	H_2: There will be no difference in student achievement between those using the Supplemental Instruction (SI) method of tutoring and the one-to-one method of tutoring.	X	
	H_3: There will be no difference in student achievement among those whose ethnicity is Native American, Caucasian, or Oriental.	X	
2.	H_1: There will be no significant interaction between the independent variables of methods of tutoring and student gender on the dependent variable of achievement.	X	
	H_2: There will be no difference in student achievement between those using the SI method of tutoring and the one-to-one method of tutoring.	X	
	H_3: There will be no difference in student achievement between gender types of male and female.	X	
3.	H_1: There will be no significant interaction between the independent variables of methods of tutoring and student type on the dependent variable of achievement.	X	
	H_2: There will be no difference in student achievement between those using the SI method of tutoring and the one-to-one method of tutoring.	X	
	H_3: There will be no difference in achievement between student types categorized as traditional or non-traditional.		X
4.	H_1: There will be no significant interaction between the independent variables of methods of tutoring and college major on the dependent variable of achievement.	X	
	H_2: There will be no difference in student achievement between those using the SI method of tutoring and the one-to-one method of tutoring.	X	
	H_3: There will be no difference in student achievement between college majors who are vocationally or non-vocationally designated.	X	

Table 32--Continued.

No.	NULL HYPOTHESIS STATEMENTS	Retained	Rejected
5.	H_1: There will be no significant interaction between the independent variables of methods of tutoring and prior educational attainment.	X	
	H_2: There will be no difference in student achievement between those using the SI method of tutoring and the one-to-one method of tutoring.	X	
	H_3: There will be no difference in achievement between students who formally graduated from high school and those who did not formally graduate from high school.	X	
6.	H_1: There will be no significant interaction between the independent variables of student ethnicity and student gender on the dependent variable of achievement.	X	
	H_2: There will be no difference in student achievement among those whose ethnicity is Native American, Caucasian, or Oriental.	X	
	H_3: There will be no difference in student achievement between gender types of male and female.	X	
7.	H_1: There will be no significant interaction between the independent variables of student ethnicity and prior educational attainment on the dependent variable of achievement.	X	
	H_2: There will be no difference in student achievement among those whose ethnicity is Native American, Caucasian, or Oriental.	X	
	H_3: There will be no difference in achievement between students who formally graduated from high school and those who did not formally graduate from high school.	X	
8.	H_1: There will be no significant interaction between the independent variables of student ethnicity and college major on the dependent variable of achievement.	X	
	H_2: There will be no difference in student achievement among those whose ethnicity is Native American, Caucasian, or Oriental.	X	
	H_3: There will be no difference in student achievement between college majors who are vocationally or non-vocationally designated.	X	

Table 32--Continued.

No.	NULL HYPOTHESIS STATEMENTS	Retained	Rejected
9.	H_1: There will be no significant interaction between the independent variables of student ethnicity and student type (which consists of traditional and non-traditional students) on the dependent variable of achievement.	X	
	H_2: There will be no difference in student achievement among those whose ethnicity is Native American, Caucasian, or Oriental.	X	
	H_3: There will be no difference in achievement between student types categorized as traditional or non-traditional.		X
10.	H_1: Retention level is independent of the SI and one-to one tutoring methods for the first year following treatment.		X
	H_2: Retention level is independent of the SI and one-to one tutoring methods for the second year following treatment.		X
11.	H_1: Retention level is independent of student ethnicity (that is, Native American, Caucasian, and Oriental) for the first year following treatment.		X
	H_2: Retention level is independent of student ethnicity (that is, Native American, Caucasian, and Oriental) for the second year following treatment.		X
12.	H_1: Retention level is independent of student gender for the first year following treatment.	X	
	H_2: Retention level is independent of student gender for the second year following treatment.	X	
13.	H_1: Retention level is independent of prior educational attainment for the first year following treatment.		X
	H_2: Retention level is independent of prior educational attainment for the second year following treatment.		X
14.	H_1: Retention level is independent of college majors that are designated as vocational or non-vocational for the first year following treatment.	X	
	H_2: Retention level is independent of college majors that are designated as vocational or non-vocational for the second year following treatment.	X	
15.	H_1: Retention level is independent of student type (that is, traditional and non-traditional) for the first year following treatment.		X
	H_2: Retention level is independent of student type (that is, traditional and non-traditional) for the second year following treatment.	X	

CHAPTER 5

SUMMARY, CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

Introduction

This chapter presents a short summary, conclusions giving the results of the study, implications suggesting various ramifications of the findings, and recommendations for further study.

Summary of the Study

The problem of this study was to compare the effectiveness of two tutoring methods with regard to achievement and retention for high-risk students at Northern Montana College. Additional general questions posed were:

(1) To what extent did the methods of tutoring affect student achievement?

(2) To what extent did methods of tutoring affect student retention?

(3) How did the methods of tutoring compare in terms of cost effectiveness?

Conclusions of the Study

Six independent variables and two dependent variables were selected for the study of the research population. The review of literature, reliability and validity, and information available determined the variables used.

Statistical analyses for the first set of nine hypotheses revealed analyses for 159 students in the population. Students who were missing in the analyses were early dropouts, students who failed to take either the pretest or the posttest, and students who repeated the course and treatment for the second or third time.

For the first set of nine hypotheses, only one individual hypothesis differentiated in achievement as measured by the pretest-posttest gain score. There was a difference in student achievement between student types classified as traditional and non-traditional. Traditional students had a mean gain score of 1.03, while non-traditional students had a mean gain score of 1.69. A distinction between traditional and non-traditional students was made using the Montana University System's admission policy that defines traditional students as 21 years of age and younger who enroll in college for the first time. Consequently, students who were enrolling in college for the first time at age 22 or older were considered to be non-traditional students.

Regardless of the type of tutoring received (SI or one-to-one), non-traditional students showed improved achievement as measured by the gain

score. Although it is beyond the scope of this study, the increased achievement measures shown by the non-traditional students might be attributed to more clearly defined educational goals and more life experience (i.e., maturity) that result in increased motivation for success.

The recent findings of Rogers, Gilleeand, and Dixon (1988) provided evidence that non-traditional students are more goal oriented. Their study was conducted through the Lifelong Education Division of North Carolina State University. The population consisted of students 25 years of age and older enrolled during the fall of 1985 in credit courses. A stratified random sample was drawn of 464 students who were surveyed by means of a questionnaire. The questionnaire asked for responses to 16 items that inquired why these students were continuing their education. The top four reasons given were all goal-oriented; that is, to get a better paying job, to work toward a degree, to upgrade skills, and to prepare for a career change.

Non-traditional students generally have more life experience, which translates into greater maturity. This maturity was characterized in an analysis by Roelf in *Adults as Learners* (quoted in Cross, 1983). Roelf stated:

> Older students in community colleges are more likely to know what they want out of college, to be challenged rather than bored with classes, to feel self-confident about their ability to keep up with their studies and to understand what is being taught, to spend more time studying and to express satisfaction with their classes and their instructors. (Cross, 1983, p. 70)

The studies by Rogers et al. (1988) and Roelf (cited in Cross, 1983) gave further support to the investigator's study that found non-traditional students achieved better academic performance than traditional students despite the tutoring method used.

One of the expressed intents of this study was to examine the performance of the Native American student population. Through data testing by analyses of variance (ANOVAs), the findings demonstrated that student achievement was not significantly impacted by ethnicity, nor was it impacted by gender, college major, or prior educational attainment. Relative to student achievement, it could be interpreted that Native American students performed as well as Caucasian students, males did as well as females, vocational majors did as well as non-vocational majors, and adult specials and GED-status students performed as well as high school graduates. Consequently, the only variable that appeared to change student achievement gains was whether the group of students was categorized as non-traditional.

Another expressed intent of this study was to examine whether one tutoring method was more effective than the other relative to student achievement. Despite the tutoring method, the findings of the study showed that the one-to-one method did not appear to be better than SI for the groups that were categorized by ethnicity, gender, college major, or prior educational attainment.

Tutoring overall, however, did make a significant difference in student achievement gains. The combined scores for SI tutoring and one-to-one tutoring were examined by use of a t-test that compared the total pretest-posttest gain scores. This t-test revealed a mean score of 9.6193 (i.e., grade equivalency) for the pretest and a mean score of 10.8075 (i.e., grade equivalency) for the posttest. The p-value was found significant at the 0.000 level.

Chi-square tests of independence were used for the remaining six sets of hypotheses (numbers 10 through 15). Statistical analyses revealed that seven hypotheses differentiated with regard to retention. In the first year following the treatment, retention was dependent on methods of tutoring, ethnicity, prior educational attainment, and student type. The SI method included group tutoring that followed a more systematic pedagogical approach. Individual or one-to-one tutoring followed an eclectic approach selected by the tutor and the student. Prior educational attainment was defined by three categories: those students who had formally graduated from high school, those who held high school equivalency certification by successfully completing the Tests of General Educational Development (or GED status), and those students referred to as adult specials. Adult specials were those students who neither graduated from high school nor had GED status; however, under the institution's open-admission policy, they were allowed to matriculate at the college.

Two separate years were examined in conjunction with hypotheses 10 through 15. The population for the first year following treatment consisted of 206 students, with 13 early dropouts. The population for the second year following treatment was 92 students, with 114 dropouts; seven of the 114 dropouts were missing, which left 107 students in this group. The frequency analysis on the 107 dropouts in the second year following treatment showed that 53.38% of the students in SI dropped out as opposed to 49.32% of the students in the one-to-one tutoring. Caucasian students had a 47.40% dropout rate as compared to 68.00% for the Native American student group; high school graduates had a dropout rate of 50.30% compared to 57.58% for the G.E.D. group; traditional students had a 47.75% dropout rate compared to 56.84% for non-traditional students; and vocational majors had a 45.08% dropout rate as compared to a dropout rate of 61.91% for non-vocational majors.

Three hypotheses were found to be significant during the second year following treatment. Differences were noted between retention and tutoring method, ethnicity, and prior educational attainment. Therefore, in the second year following treatment, retention was not independent of tutoring method, ethnicity, and prior educational attainment. Further examination of the second year of retention with regard to ethnicity showed that Native American students had a greater number than expected in the low retention group, while the medium and high retention groups had fewer numbers than were

expected. The Caucasian group, on the other hand, had a lower number than expected in the low retention group and greater numbers than expected in the medium and high retention groups. Thus, the Caucasian group demonstrated better results with retention than the Native American group.

The differences that were found for the second year following treatment (using chi-square) were only for those 92 students who continued at Northern Montana College. As indicated earlier, 114 students dropped out after the first year of treatment, seven of whom were missing in the informational data.

The following is a discussion concerning the rejection of the null hypotheses for three of the chi-square analyses. As discussed earlier, retention was not independent of the tutoring methods for the first and second years following treatment. The one-to-one tutoring method results indicated a greater number than expected for the low retention group, while the medium and high retention groups had fewer numbers than were expected. However, the SI tutoring method resulted in a lower number than expected in the low retention group, and an increase in the numbers expected for the medium and high retention groups. Therefore, the SI tutoring group had an increased retention rate compared to the one-to-one tutoring group.

Postulating about why the SI tutoring group had a higher retention rate than the one-to-one tutoring group is beyond the scope of this study. However, this finding does appear to lend support to the research of Blanc et al. (1983). At the University of Missouri-Kansas City, Blanc et al. found that

a greater percentage of students using SI, as compared to students who were categorized as non-SI, re-enrolled in school two semesters later. The non-SI group, as defined by the Blanc et al. study, was divided into two groups: motivational control (132 students) and all others (353 students). The students in the motivational control group were those who indicated an interest in SI but who, for personal reasons, could not attend sessions. The number of students in the SI group was 261.

An explanation for the finding that Native American students had an increased attrition rate when compared to Caucasian students is beyond the scope of this study as well. However, the higher attrition rate of Native American students in this study may support some of the observations of other researchers (Benham, 1975; Gilliland & Reyhner, 1988; Huffman, Sill, & Brokenleg, 1986).

Gilliland and Reyhner (1988) stated, "Throughout the world, wherever the Native people have become the minority, they have found themselves under great pressure to adopt the culture, values and ways of life of the dominant society. Nowhere has this been more evident than in the schools" (p. 33). They further commented that the result, as educational statistics indicate, has been a high dropout rate for Native Americans.

Huffman et al. (1986) stated, "The major challenges facing white students are not likely to be cultural concerns but social concerns" (p. 33). Huffman et al. cited Edgewater (1981), who recognized that Native American students

tend to bring to college a strong sense of cultural identity and a set of values and goals that are different from the university or college that they attend. Huffman et al. also stated that a number of Native American students are concerned about losing their "Indianness" by being absorbed into the mainstream of the college setting and, as a result, many students leave school. In citing Hallowell (1963) and Sill (1967), Huffman et al. wrote, "The challenge for Native American students becomes the ability to interact on two cultural levels simultaneously" (p. 33).

Benham (1975) reported that Native American students have cultural differences which, in many ways, cause them to stand aside from the general population. In the case of higher education, the school is a cultural transmission instrument and minority students in a majority setting may not find the support they need.

Implications of the Study

No statistical difference was found between the two tutoring groups (SI and one-to-one) and the level of student achievement in this study. However, there appeared to be a significant difference in cost effectiveness between the two groups. Generally, it can be concluded that an academic assistance program budget could serve many more students at least as effectively for the same dollar amount when the SI tutoring method is employed as compared to the one-to-one method.

Northern Montana College is located in a relatively rural region with a designated mission to serve the state's vocational-technical degree program needs. Due to a variety of economic and social factors, students need to delay program entry and completion in a manner typical of a community college. The average student age in this study was 29 years. It is therefore plausible that the results of this study may be more appropriately generalized to rural, vocational and technical institutions, and to community colleges.

At least five other ramifications of this study merit some probing. The first is that the effect of treatment seemed to be short-term. A substantial number of students dropped out during the second year following treatment. It was not the purpose of this study to follow or track the dropout students, but to examine instead the students who continued in college after treatment. However, the percentages of the particular groups who dropped out have been reported.

The second ramification is that the investigator and others observed uncharacteristic groupings of students during the treatment year. Homogeneous groupings often are the norm, but students in the SI treatment were seen studying (outside of regularly scheduled sessions) in heterogeneous groupings. For example, such a heterogeneous student group could be composed of a 52-year-old Caucasian female, a 29-year-old Native American female, an 18-year-old Caucasian female, a 34-year-old Native American male, and a 21-year-old Caucasian male. These seemingly uncharacteristic groups of students were primarily students who became acquainted with one another

in the SI sessions. These students indicated additional benefits in group tutoring from a social perspective and consequently felt comfortable conferring with other group members when they needed additional assistance in English 150.

The third ramification that merits examination is the effect tutoring had on the tutors. The investigator informally interviewed all of the tutors who participated in this study, and the SI tutors appeared generally more excited and enthusiastic about tutoring. Oddly enough, three of the seven SI tutors discovered from group tutoring that they genuinely enjoyed teaching. Two of these three student tutors were business majors and one was a vocational-technical major. All three of these tutors changed the emphasis of their majors to education so they could become professional teachers. Some of the one-to-one tutors also expressed their enjoyment of the teaching aspect of tutoring, but they often became more easily frustrated with tutoring when students canceled scheduled tutoring sessions. Unfortunately, as might be expected with this high-risk group, students often missed their scheduled tutoring sessions. SI tutors generally did not experience the same frustration, since their sessions were with groups.

A fourth ramification was that a notable number of students dropped out of English 150 during the treatment period. This was anticipated, to a degree, since by definition English 150 was a course for high-risk students. However, the attrition rate may have been reduced if the additional course requirement of tutoring had been advertised prior to course enrollment. The College

Board, under the direction of Ramist (1981), produced a report entitled *College Student Attrition and Retention.* This report suggested, "Notify students early, preferably by means of the catalog, about any unusual features of a program" (p. 18).

A final ramification deals with the students who repeated the course and the treatment. This group was tested statistically, but was found to be too small for analysis. However, it should be noted that the overwhelming majority of these students did poorly on achievement when they originally participated in treatment, and then again when they repeated treatment. Therefore, treatment would not be cost effective with repeat students.

Recommendations

(1) Further study on the merits, effectiveness, and value of SI and individual tutoring is needed; particularly valuable would be research on groups of students who do not volunteer for tutoring but are assigned tutoring, possibly as a course requirement based on academic need. Most, if not all, of the current literature is based on students who volunteered for tutoring. Conceivably, volunteers could be more motivated and therefore bias the study.

(2) A further caution about the generalizability of this study is germane. The results of this study may be more easily generalizable to rural, vocational-technical institutions as well as community colleges.

(3) If mandatory tutoring is appropriate, early notification to students, preferably by means of the college catalog, is recommended (refer to Ramist, 1981, p. 18).

(4) Devising a diagnostic screening process to determine whether a group or individual tutoring process is more appropriate for students is strongly recommended for future research and/or practice. Students who request or require individual tutoring certainly should be screened out initially.

(5) An increased amount of funding nationwide is being spent on developmental education. Traditional student enrollment demographics have declined and many institutions of higher education are still funded by student-driven formulae, so the cost savings from the SI or group tutoring become increasingly important. No increased achievement or retention gains were found with individual tutoring as compared to SI in this study; in fact, SI students who continued in college did better than individually tutored students relative to retention. Therefore, the findings of this study suggest utilization of SI or group tutoring except where obvious or requested individual tutoring is warranted.

(6) Further study concerning the attitudes, values, and beliefs of tutors, faculty, staff, and students involved with academic assistance programs would be useful. This investigation should include how the different constituents perceive tutoring as an assistance system, both academically and non-academically.

(7) For the purpose of this study, no difference was found in achievement based on method of tutoring and ethnicity. Further study is warranted regarding the best learning environments related to ethnicity. When conducting research on minority students, Newman (1985) offered suggestions provided by Chickering, who stated that special consideration should be given to "active student participation, recognition of student strengths, academic cooperation, not competition, individual tutoring, concrete applications of what is taught, narrative evaluations of student progress, recognition of achievement, and role modeling provided by teachers" (pp. 225-226).

(8) What appeared to be the most important variable in this study with regard to student achievement was student type (i.e., traditional or non-traditional). Non-traditional students may be more achievement-oriented than others, so academic assistance programs may be more appropriate for these students. Most academic assistance programs are geared towards helping students achieve. However, concerns about method of tutoring, student gender, ethnicity, major, and prior educational attainment in relationship to student achievement were not supported by the findings of this study. Therefore, if an academic assistance program is set up based on the notion that one needs to treat method of tutoring, gender, ethnicity, major, and prior educational attainment populations differently to encourage student achievement, such a need is not supported by the findings of this research.

(9) One of the variables that may need further study related to student achievement is a student's socio-economic level. Socio-economic levels can be difficult to determine with true reliability and validity, but nevertheless may be useful in determining what affects student achievement.

(10) Due to the short-term effect of tutoring, as supported by evidence in this study, an extension of tutoring is recommended. Students may be more successful academically, particularly high-risk students, if they continue their higher education simultaneously with tutoring for those courses which pose difficulty for them. Longitudinal tracking of students who drop out of tutoring, and higher education altogether, is advised to provide a better understanding of what happened to these students.

(11) The final recommendation is related to individual students' needs. Inherently, some students will do better in group tutoring, while others will perform better in individual tutoring. The Myers-Briggs Type Indicator alludes to the idea that extroverts derive their energy from others, while introverts draw their energy from introspection (Myers & McCaulley, 1989). Therefore, it may be possible that extroverts would respond better to group tutoring, whereas introverts may respond better to one-to-one tutoring. Additionally, students with specific learning problems, such as dyslexia, may need more individualized assistance. This is an implication for further research.

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APPENDICES

APPENDIX A

ACADEMIC ASSISTANCE SURVEY

Name:	
Date:	S.S. No:
Course Name:	Major:
Sex:	Date of Birth:

Student Services will offer weekly supplemental review sessions for students enrolled in this course. This survey has two purposes: (1) We want to determine the most convenient times to schedule review sessions, and (2) we want to see how effective supplemental review is for students at NMC. Responses you make on this survey will be kept ***CONFIDENTIAL.***

PART 1

(1) On a scale of 1 to 5 (with 1 = not interested at all and 5 = very interested), please indicate your interest in English 150.

(a) 1 (b) 2 (c) 3 (d) 4 (e) 5

(2) Did your advisor or counselor encourage you to take this course?

(a) Yes (b) No

(3) How long ago did you graduate from high school?

(a) Less than 2 years
(b) 3-4 years
(c) 5-10 years
(d) More than 10 years

(4) How many credit hours are you taking this quarter?

(a) Less than 9 (b) 10-12 (c) 13 or more

(5) How many hours do you expect to work per week (including work study) during this quarter?

(a) 1-10
(b) 11-20
(c) 21-30
(d) 31-40
(e) None -- will not work

(6) How well do you expect to do in this course?

(a) Very well (A or B)
(b) Average (C)
(c) Below average (D or F)

(7) What is your classification level?

(a) Freshman
(b) Sophomore
(c) Junior
(d) Senior
(e) Graduate Student
(f) Other

(8) What is your ethnic origin?

(a) American Indian/Alaska Native
(b) Asian/Pacific Islander
(c) Black
(d) Caucasian
(e) Hispanic
(f) Non-Resident Alien
(g) Other

(9) What are your future plans for college?

(a) I intend to return to NMC next quarter and to graduate from NMC sometime in the future.
(b) I intend to return to NMC next quarter. but will transfer to another college before I graduate.
(c) I do not intend to return to NMC next quarter, but will transfer to another college at the end of this quarter.
(d) I do not intend to return to NMC or another college next quarter.
(e) Undecided/Other

PART II

*DIRECTIONS: Mark with an "X" on the schedule below the hours that you **ARE AVAILABLE** to attend supplemental review sessions.*

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
8 AM					
9 AM					
10 AM					
11 AM					
12 PM					
1 PM					
2 PM					
3 PM					
4 PM					

Could you attend Monday nights from 7 PM to 9 PM? (a) Yes (b) No

Could you attend Wednesday nights from 7 PM to 9 PM? (a) Yes (b) No

[Adapted from D.C. Martin et al. (1983), Supplemental instruction: A model for student academic support (Kansas City, MO: University of Missouri), pp. 55-56.]

APPENDIX B

SPECIAL SERVICES APPLICATION FORM, NORTHERN MONTANA COLLEGE

SPECIAL SERVICES APPLICATION (1986-87)

Office Use Only ▸ No:_____
▸ Date:_____
▸ SS [ ] LC [ ]

I. PERSONAL INFORMATION

Name:_____ NMC ID No:_____

College Address:_____ Birthdate:_____

_____ Local Phone:_____

_____ Home Phone:_____

Permanent Address:_____ Year in School: [ ] FR [ ] SO

_____ [ ] JR [ ] SR [ ] GRAD

_____ Year first attended NMC:_____

Sex: [ ] Female [ ] Male Veteran: [ ] Yes [ ] No

Social Security No:_____

Citizenship:
[ ] U.S. citizen
[ ] U.S. resident for other than a temporary purpose
[ ] Foreign student studying in the U.S.
[ ] Other:_____

Ethnic Background:
[ ] American Indian [ ] Hispanic
[ ] Asian American [ ] White
[ ] Black [ ] Other:_____

II. ELIGIBILITY INFORMATION

First Generation

Did your mother graduate from a 4-year college? [ ] Yes [ ] No

Did your father graduate from a 4-year college? [ ] Yes [ ] No

Handicapped

Do you have any physical disabilities? [ ] Yes [ ] No

If yes, please describe:_____

How has the disability affected your educational objectives?_____

_____

Low Income

Are you a dependent of your parents for income tax purposes? [ ] Yes [ ] No

If yes, how many persons (including yourself) live with your parents?_____

If no, how many dependents (including yourself) live with you?_____

What is your family income? (Check one category.)

[ ] $ -0- to $8,040 [ ] $13,681 to $16,500 [ ] $22,141 to $24,960

[ ] $8,041 to $10,860 [ ] $16,501 to $19,320 [ ] $24,961 to $27,780

[ ] $10,861 to $13,680 [ ] $19,321 to $22,140

III. EDUCATIONAL INFORMATION

Please indicate your current enrollment status at NMC:

[ ] Accepted to work towards an undergraduate degree

[ ] Enrolled in General Studies

[ ] Enrolled in major of:_____

Advisor:_____

Please list all technical schools and colleges you have attended:

School	Address	Dates From / To	Degree/Diploma or credit hrs.

Have you taken the ACT exam? [ ] Yes [ ] No

High School Attended:_____ Location:_____

Date of Graduation:_____ or GED:_____ High School GPA:_____

High School Rank: [ ] Upper 25%ile [ ] Upper 26-50%ile [ ] Below 50%ile

IV. FINANCIAL INFORMATION

Are you receiving financial aid from this institution? [ ] Yes [ ] No

Type of Aid: [ ] Pell Grant [ ] BIA [ ] Voc-Rehab [ ] Loan

[ ] Work Study [ ] NDSL [ ] SEOG

[ ] Other:_____

I would like help in the following areas:

[ ] Educational Skills
[ ] Writing Skills
[ ] Reading Skills
[ ] Study Skills
[ ] Math
[ ] Personal Counseling
[ ] Financial Aid

WRITTEN STATEMENT

Please write a brief statement about yourself, your educational and career goals and objectives, and the reason you desire services from the Special Services program.

_____

_____

_____

_____

_____

_____

_____

Who referred you to the Special Services program at NMC? How did you find out about the program?_____

_____

I certify that the information reported is accurate and complete to the best of my knowledge. I hereby grant permission to the Special Services program to secure the necessary information pertinent to my participation in the program and success at Northern Montana College, e.g., financial aid information, standardized test scores, transcripts, etc.

_____
Student's Signature

Date:_____

APPENDIX C

SPECIAL SERVICES: ANNUAL LOW INCOME LEVELS

SPECIAL SERVICES:
ANNUAL LOW-INCOME LEVELS

(Governs participant eligibility for program services)
- Program Year 1988-89 -

Table 33. Special Services: Table of annual low-income levels.*

Size of Family	Family Taxable Income Must Be Less Than:**
1	$ 8,250
2	11,100
3	13,950
4	16,800
5	19,650
6	22,500
7	25,350
8	28,200
9	***

Note: Add 15% for Hawaii and 25% for Alaska.

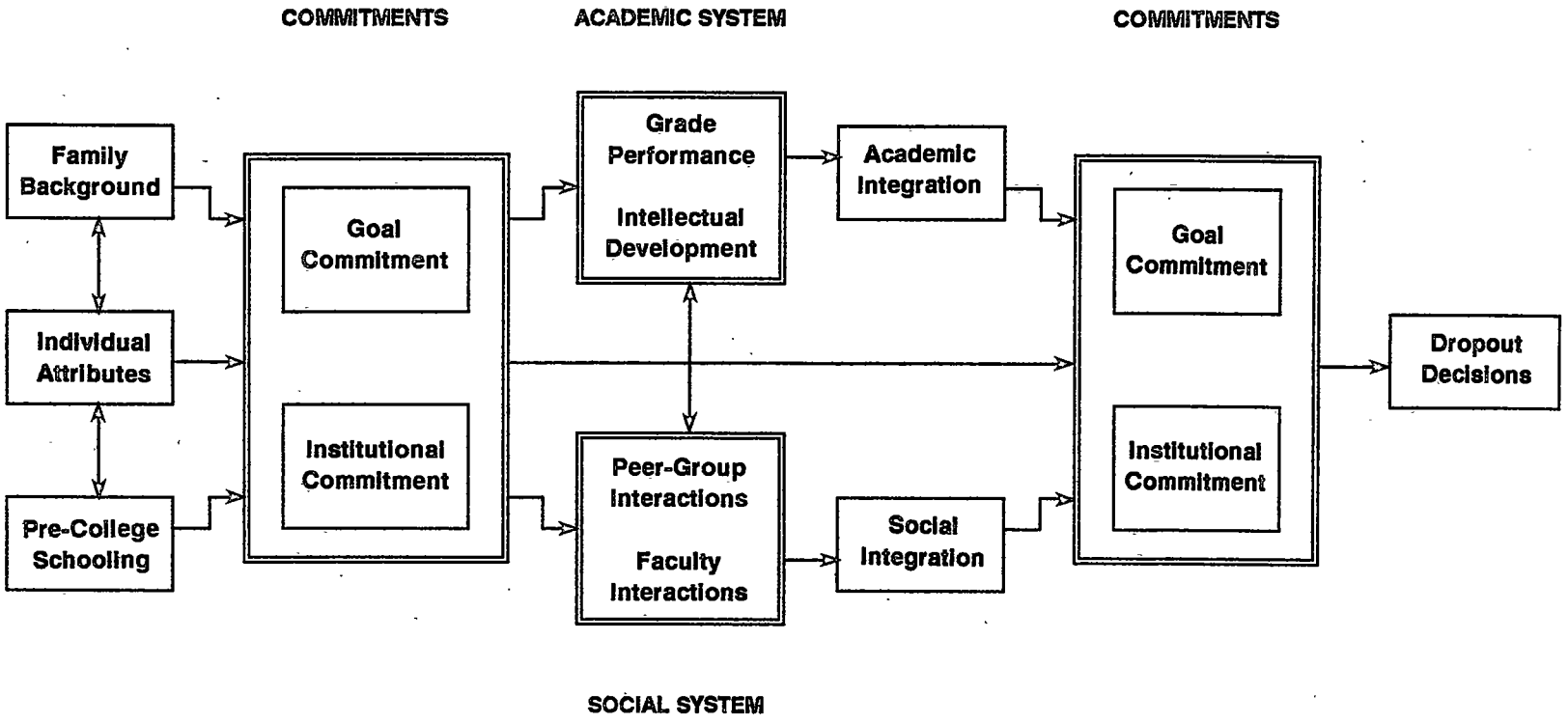
*Preliminary data, subject to change. The U.S. Bureau of the Census updates the poverty threshold figures in the fall of each year. Projects that are funded will be provided updated figures with their grant award papers, or as soon thereafter as updated data are available.

**The figures in this column represent amounts equal to 150% of the family income levels established by the U.S. Bureau of the Census for determining poverty status. These levels were published by: U.S. Department of Health and Human Services (20 February 1987), Federal Register, 52(34), 5340-5341.

***For all families with more than eight members, add $2,850 for each additional member.

APPENDIX D

VINCENT TINTO'S CONCEPTUAL SCHEMA FOR DROPOUT FROM COLLEGE



Source: V. Tinto (1975), Dropouts from high education: A theoretical synthesis of recent research, Review of Educational Research, 45, 95.

Figure 2. Vincent Tinto's conceptual schema for dropout from college.

APPENDIX E

REASONS GIVEN BY STUDENTS FOR DROPPING OUT OF COLLEGE

Table 34. Reasons given by students for dropping out of college.*

Response Item	Men	Women	All Students
Boredom with courses	36	25	32
Financial difficulties	29	27	28
Some other reason	31	24	28
Marriage, pregnancy, or other family responsibilities	11	39	23
Poor grades	28	14	22
Dissatisfaction with requirements or regulations	24	20	22
Change in career goals	19	20	19
Inability to take desired courses or programs	12	9	11
Good job offer	10	6	9
Illness or accident	7	7	7
Difficulty commuting to college	3	3	3
Disciplinary troubles	2	2	2

*Source: A.W. Astin (1975), Preventing students from dropping out (San Francisco: Jossey-Bass), p. 14.

APPENDIX F

RELATIONSHIP BETWEEN STUDENT CHARACTERISTICS AND PERSISTENCE

Table 35. Relationship between student characteristics and persistence.*

Characteristic	Related to Persistence	Related to Attrition	Not Related or Not Clear
Demographic Factors:			
▸ Age			X
▸ Sex			X
▸ Parental income			X
▸ Parental education	High level	Low level	
▸ Father's occupation			X
▸ Ethnic group	Oriental, Hispanic		
▸ Religion	Jewish		
▸ Marital status	Married male	Married female	
▸ Hometown location	Contiguous state	Out-of-state but not contiguous	
▸ Hometown size		Small town	Big city; suburb
Academic Factors:			
▸ High school record	Good record	Poor record	
▸ SAT	High scores	Low scores	
▸ College Board Achievement Tests	Taking test, particularly high scorer	Not taking test	
▸ High school program	College preparatory		
▸ High school academic rating	Good rating	Poor rating	
▸ High school size			X
▸ High school type			X
▸ Years of study of various subjects	More than average in English, mathematics, foreign language, or physical science	Less than average in English, mathematics, foreign language, or physical science	Years of study in social studies and biological science
▸ Performance in college	Good grades	Poor grades	
Institutional Factors:			
▸ Type of college	Four-year	Two-year	
▸ Control of college	Private	Public	
▸ Religion	Religiously affiliated		
▸ Coeducation	Single-sex		
▸ Location	Northeast; South	West; Southwest	
▸ Academic level	Selective	Nonselective	
▸ Size			X
▸ Match of student/college	Student/college fit in terms of hometown/college size, religion, race, & parental education/selectivity High-ability student at selective college	Lack of student/college fit in terms of hometown/college size, religion, race, & parental education/selectivity Low-ability student at nonselective college	High-ability student at nonselective college Low-ability student at selective college
Study Factors:			
▸ Areas of study	Biological science; health-related professions History & cultures Elementary education	Agriculture Forestry & conservation Physical education Architecture & environmental design Engineering Psychology Police science	Business Education (other than elementary) Social sciences (other than psychology)
▸ Study habits		Poor habits	

(continued . . .)

Table 35--Continued.

Characteristic	Related to Persistence	Related to Attrition	Not Related or Not Clear
Motivational Factors:			
▸ Degree-level goal	High goal	Low goal	
▸ Vocational goal			X
▸ Precollege expectation			X
▸ Reasons for attending college			X
▸ Parental influence			X
Personal Factors:			
▸ Personality traits			X
▸ Expressed need for personal counseling		X	
▸ Smoking cigarettes		X	
Financial Factors:			
▸ Tuition	At predominantly black colleges		At predominantly white colleges
▸ Parental aid	X		
▸ Spouse support	Major support		
▸ Financial aid			X
▸ Scholarships or grants			X
▸ Loans			X
▸ Employment	Part-time on campus	Full-time	Part-time off campus
▸ Other forms of aid	Federal work-study	GI benefits	
	ROTC benefits	Financial aid packages	
▸ Information			X

*Source: L. Ramist (1981), College student attrition and retention, Report No. 81-1 (New York: The College Board), pp. 25-27.

APPENDIX G

UNDERSTANDING PIAGET

UNDERSTANDING PIAGET*

LEARNING IN GENERAL

(1) Learning is not spontaneous; rather, it is provoked by situations and experiences.

(2) "Development is the essential process and each element of learning occurs as a function of total development rather than being an element which explains development." Development determines learning; learning does not determine development.

(3) "Knowledge is not a copy of reality." "To know an object is to act on it." Knowing something means you can transform it, modify it, interact with it, and manipulate the variables associated with it. Knowing something is not limited to memorizing, reciting, and copying.

(4) Knowledge comes from operational structures (mental structures) that allow for mental operations. Operations are interiorized, reversible, and always linked to other mental operations.

(5) The central problem of understanding development (and hence learning) is to understand the formulation, elaboration, and functioning of these structures.

THREE STEPS OF DEVELOPMENT

(1) Sensory-Motor Stage: Intellectual development begins with the development of a series of structures necessary for later thought processes. Until these structures develop, later learning must wait. As an example, the structures lead to the following:

(a) permanence of objects
(b) spatial relationships
(c) temporal succession
(d) elementary sensory motor causality

(2) Pre-Operational Stage: This stage is a bridge between the sensory-motor and the operational stages. Piaget sees this stage as a time for restructuring and refinement of the mental structures acquired during the sensory-motor stage. The following are characteristics of the pre-operational individual:

(a) language development
(b) egocentrism
(c) absence of reversibility
(d) perception-bound
(e) transductive reasoning

During this stage, individuals have the ability to reason about objects or concrete experiences. They can gather data from the object or experience, can organize the data, and can carry out mental manipulations on the data. Operations possible at this stage include:

(a) classification
(b) ordering
(c) reversibility
(d) conservation
(e) idea of numbers
(f) spatial and temporal operations

(3) Formal Operational: Individuals can perform mental operations using not only objects and experiences, but also hypotheses. This ability leads to the development of concepts whose meanings are derived through their position within a postulatory-deductive system. These concepts are not derived through the senses, but through logical relationships within each system. Formal operational individuals are capable of the following:

(a) identification and control of variables
(b) probabilistic thinking
(c) proportional reasoning
(d) combinatorial logic
(e) systematic problem solving

FACTORS THAT PROMOTE INTELLECTUAL DEVELOPMENT

Four main factors interact to explain development from one set of structures to the next:

(1) Maturation: Learning cannot begin without appropriate maturation, in particular the development of the nervous system, the endocrine system, and the physical growth of an individual.

(2) Experience: Piaget describes two types of experiences that promote intellectual development.

   (a) Physical experiences: These experiences occur when a learner physically interacts with objects in his/her environment and with the environment in general.

   (b) Logico-mathematical experiences: These are experiences in which knowledge comes from operations on the objects and not from the objects themselves (for example, discovering the reversibility of numerical processes, i.e., $4 \times 5 = 5 \times 4$).

(3) Social Transmission: Social transmission occurs through social interactions with other human beings. These interactions can be verbal as well as written, and can include informal as well as formal instruction.

(4) Equilibrium: Piaget sees equilibration as the fundamental factor. This factor is the desire of the human organism to be in a state of mental and physical harmony. The individual self-regulates as compensation for disturbances in how s/he perceives the world. These disturbances result in disequilibrium. Piaget says that learning occurs as individuals move from a state of disequilibrium to one of equilibrium.

None of these four factors is sufficient to explain development by itself, but each contributes to development.

*Source: Jean Piaget as cited by D.C. Martin et al. (1983), Supplemental instruction: A model for student academic support (Kansas City, MO: University of Missouri), pp. 63-65.

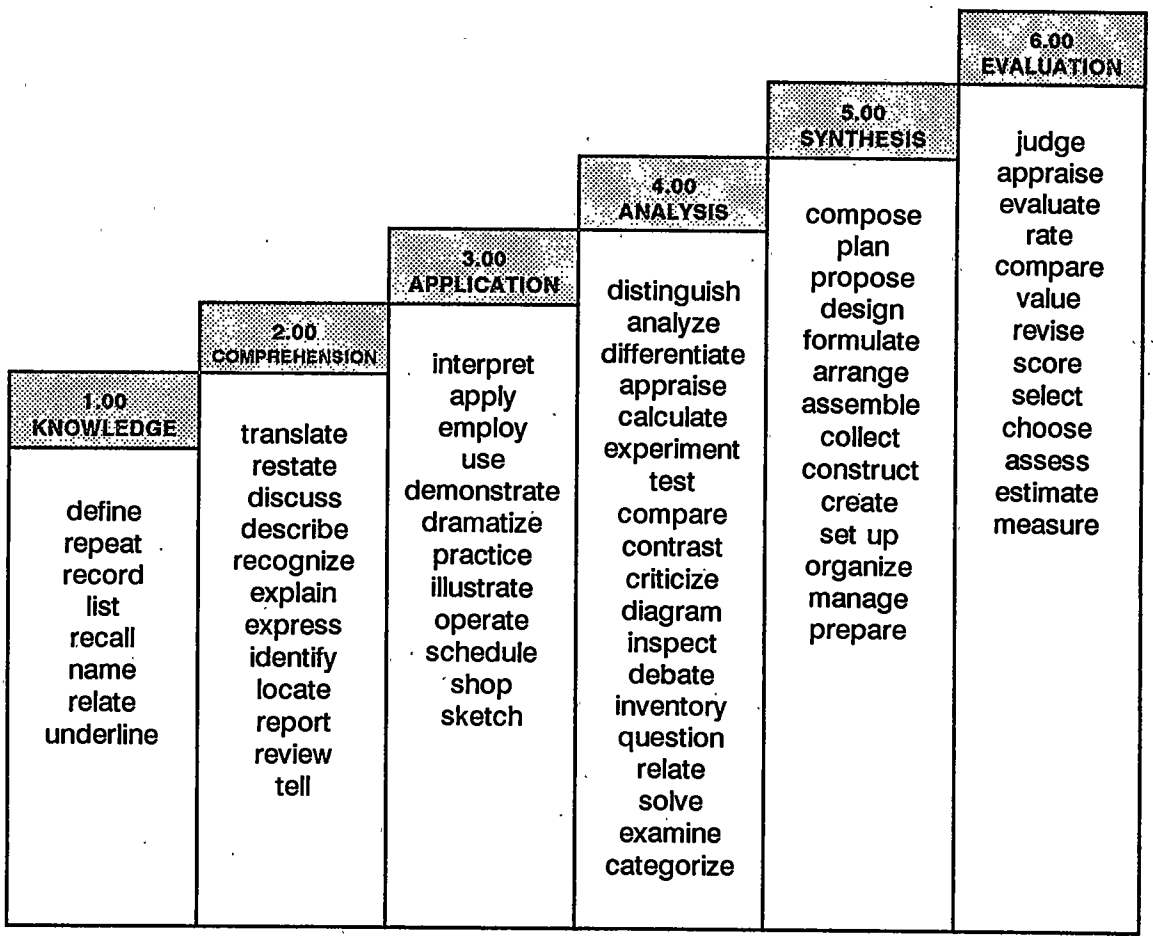
APPENDIX H

AN ADAPTATION OF BLOOM'S TAXONOMY

OF EDUCATIONAL OBJECTIVES

AN ADAPTATION OF BLOOM'S TAXONOMY OF EDUCATIONAL OBJECTIVES*

with adapted verbs useful in stating cognitive outcomes



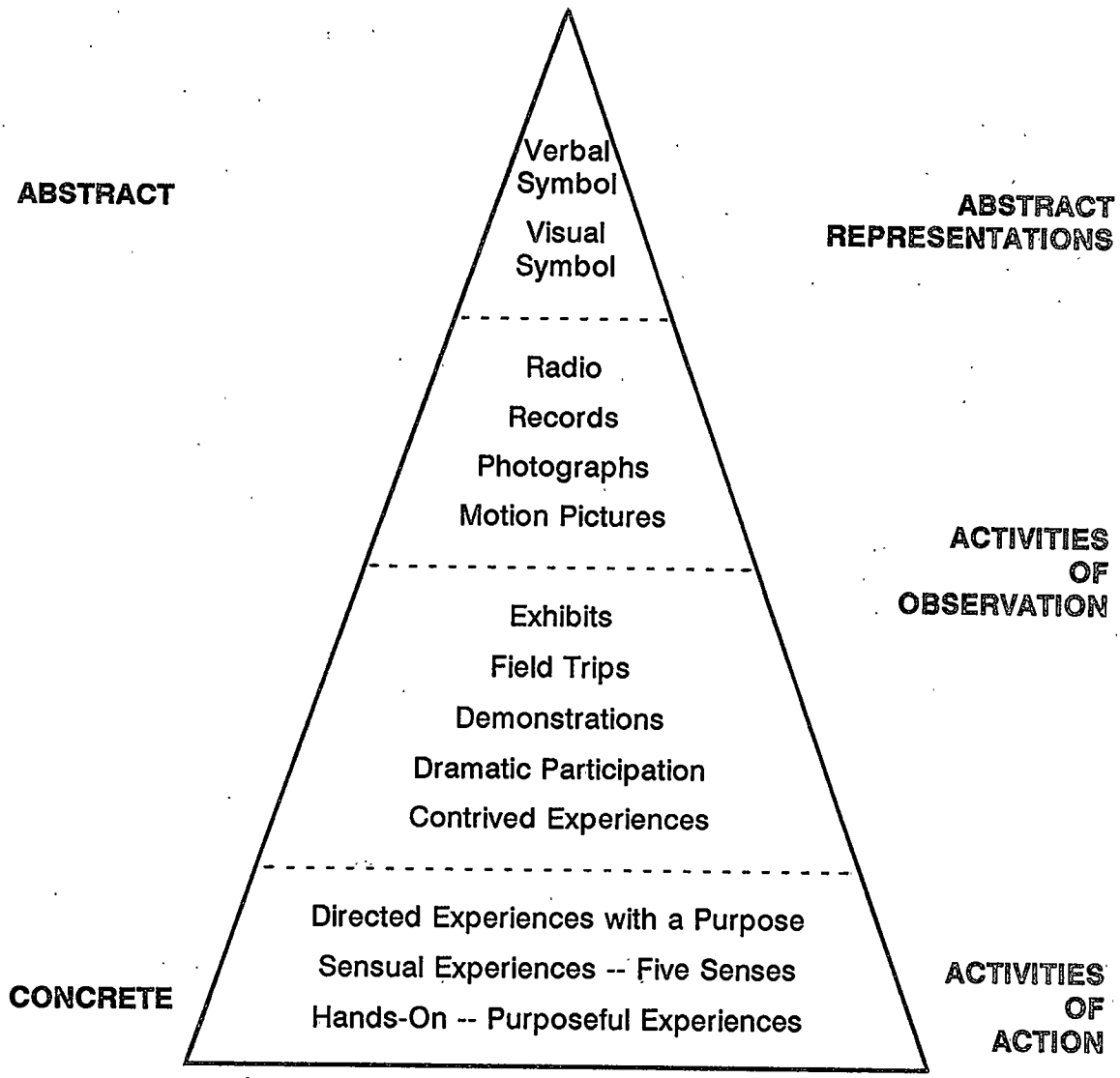
*Adapted from B. Bloom, Taxonomy of Educational Objectives, as cited in D.C. Martin et al. (1983), Supplemental instruction: A model for student academic support (Kansas City, MO: University of Missouri), p. 66.

Figure 3. An adaptation of Bloom's Taxonomy.

APPENDIX I

EDGAR DALE'S

"CONE OF EXPERIENCE"



NOTES: (1) Learning progresses from the concrete to the abstract.
(2) Intellectual life functions primarily on a very high level of abstraction of symbolization.
(3) Students need much experience at concrete levels before they can solve abstract questions and problems with good comprehension.

Source: Edgar Dale, cited by D.C. Martin et al. (1983), Supplemental Instruction: A model for student academic support (Kansas City, MO: University of Missouri), p. 67.

Figure 4. Edgar Dale's "Cone of Experience."