

THE PREDICTIVE VALUE OF ACT SCORES IN  
DETERMINING GRADES IN SELECTED  
BUSINESS COURSES

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## CHAPTER I

### THE RESEARCH PROBLEM

#### Introduction

College educators will always have an interest in the identification of learner interests, abilities, and capabilities that predict which students should attempt or complete their college degrees. The probability that a learner will attain a certain level of success is of primary interest in guidance and placement decisions.

Virtually all colleges and universities have made it mandatory for college applicants to submit some college entrance test scores along with their high school grades as prerequisites for admission on the presumption that their test scores are one of the two most important predictors of the success or failure of college education (Price and Kim, 1976, p. 966).

The American College Testing Program (ACT) is widely available and highly respected for accuracy as a test of academic achievement.

The ACT Assessment Program is a comprehensive evaluative, guidance, and placement service for students and educators involved in the transition from high school to college. It is based on the ACT Assessment, which consists of four academic tests, self-reported high school grades, the Student Profile Section (SPS), and the ACT Interest Inventory (Sawyer, 1983, p. 1).

Each of the four ACT tests--English Usage, Math Usage, Social Studies Reading, and Natural Science Reading--is curriculum-related. The ACT Interest Inventory measures students' preferences for job-related activities in six basic interest dimensions: Science, Creative Arts, Social Service, Business Contact, Business Detail, and Technical. Through the Student Profile Section, students provide information about their background, extracurricular accomplishments, special academic needs, housing plans, financial need, planned major, and career plans.

Information from all the aspects of the ACT Assessment Program is organized into individual student profile reports which are sent to students and colleges. With the summary information provided by these reports, students and educators can make informed plans and decisions (Sawyer, 1983).

#### Statement of the Problem

The problem of this study was an attempt to determine if American College Testing Program (ACT) scores could be used to predict grades in selected accounting and business classes. This problem was undertaken by comparing students' ACT scores with their grades in principles of accounting and principles of management.

The purpose of this study was to make information available to academic counselors in their role of advising students on course selection.

According to The American College Testing Program (1983b) some of the purposes of the ACT Assessment Program are (1) to help students present themselves as persons with special patterns of educational abilities and needs, (2) to provide information to help students select college majors and make educational and career plans, (3) to provide estimates of students' academic and out-of-class abilities, and (4) to help colleges place freshmen in appropriate sections of introductory courses in English, mathematics, social studies, and natural sciences.

One goal of college admissions testing programs is to provide colleges with information about the performances of present students.. College administrators can then make generalizations to future students.

Specifically, this study was undertaken to determine if

1. the ACT Composite Score or any of the four subtest scores could predict grades in Principles of Accounting I (Accounting 2103) at Oklahoma State University; and

2. the ACT Composite Score or any of the four subtest scores could predict grades in Principles of Management (Management 3103) at Oklahoma State University.

#### Need for the Study

ACT test scores are typically used in academic advising and placement. In such uses, students are frequently able

to accept or ignore the diagnostic information that the test data provide.

When a prospective student takes the ACT Assessment, he or she provides considerable information about academic and nonacademic achievements, academic potential, interests, goals, and personal needs (Sawyer, Valiga, and Maxey, 1981, p. 1).

The American College Testing Program (1983a) stated that "Academic advising is a complex activity which should help students realize maximum educational benefits" (p. 1). Advising includes, among other things, (1) helping students explore educational and career options and links between academic preparation and the world of work and (2) helping students plan educational programs consistent with their interests and abilities (The American College Testing Program, 1983a).

Some of the benefits students derive from effective advising include: (1) attainment of their educational and career objectives; (2) achievement of GPA's consistent with their abilities; and (3) greater likelihood of remaining in school (The American College Testing Program, 1983b).

Davidson (1974) stated

What is urgently needed--and has been sought by many researchers--is a workable predictive-criteria model for processing data known about students as soon as they enter an institution, thereby defining their 'potential profile' of future performance (p. 35).

Davidson (1974) also said

The more tenable alternative appears to be development of the best possible measures of predicting achievement, persistence, and success--tested and retested, duplicated and replicated, guided by previous research--until the closest method for

adequate prediction at a specific institution is available (p. 53).

Warming (1976) said

Inasmuch as the results of research studies still provide conflicting evidence concerning variables, both cognitive and non-intellective, which best predict academic success, there exists a need for continued research. Because the relationships found in one school or with one group do not necessarily carry over or apply to another school, local studies are needed (p. 15).

Carney and Geis (1981) also contended that "Each institution should consider research to establish local validity of ACT scores" (p. 58).

Munday (1965) had previously found that predictive results varied from school to school. He also found that results varied from course subject to course subject, thereby suggesting that predictive validity for individual colleges and for specific subject matter areas should be established. Further research by Munday (1976) also showed a variation by subject matter field.

Black (1969) did a study of ACT scores for predicting college achievement and concluded that "Since the present study did not differentiate between curriculum or subjects taken, a study predicting grades for particular subjects might be of value" (p. 28).

Davidson (1974) agreed that "If any further experimentation of this nature is attempted it should be limited to studying students in narrow and clearly defined major fields of study" (p. 173).

In addition to the theory that further research should consider specific universities and specific courses, Decker and others (1974) stated "A further study could be made using the specialized ACT scores, such as Math, English, Social Science and Natural Science" (p. 30).

Worthington and Grant (1971) concluded the following: "As long as the school reward system is based on grades in courses, the continued study of student characteristics as they relate to grades is necessary" (p. 7). They felt each school should establish the value of the variables for use in admissions, program selection, and other decisions related to the educational development of its students.

As indicated by these researchers, each college or university should establish the predictive value of ACT scores. This predictive power should be studied as it relates to individual courses. In addition, all of the ACT subtest scores and the composite score should be used as prediction variables.

The present study was based on the need that had been shown from previous research. All five ACT scores were used as variables to predict success in two individual business classes at a specific university. If a predictive formula can be established, academic advisers should use the information to help students choose career options and to plan an educational program consistent with the student's ability.

### Delimitations

1. This study was delimited to the College of Business majors at Oklahoma State University graduating in May, 1986.
2. This study was delimited to those students for whom ACT data could be obtained.
3. The literature review was delimited to articles published during the last 20 years.

### Limitations

The study was limited by the following factors:

1. Possible differences in grading standards among teachers were not considered. Care should be taken when assuming that a certain grade made would have been the same under a different instructor.
2. Possible differences in particular methods of instruction among teachers were not considered. Again, care should be taken when assuming that a certain grade made would have been the same under a different instructor.
3. Varying levels of motivation among students were not considered. Care should be taken when assuming that all students with the same abilities would perform the same way.
4. Possible bias of the content of the ACT tests was not considered. Care should be taken when assuming that all students with the same abilities would receive the same scores on the ACT tests.



5. The study was also limited in generalizability to the extent that all students are similar to the Oklahoma State University students about whom data were obtained. Care should be taken when generalizations are made from the results of this study to other colleges or universities or to other courses.

### Hypotheses

The hypothesis of this study was that there was no significant difference in the achievement of students in selected accounting and management classes who had high ACT scores and those who had low ACT scores. Specifically,

1. There was no significant difference in the achievement of students in Principles of Accounting I who had high ACT Composite scores and those students who had low ACT Composite scores.

2. There was no significant difference in the achievement of students in Principles of Accounting I who had high ACT English scores and those students who had low ACT English scores.

3. There was no significant difference in the achievement of students in Principles of Accounting I who had high ACT Mathematics scores and those students who had low ACT Mathematics scores.

4. There was no significant difference in the achievement of students in Principles of Accounting I who

had high ACT Natural Science scores and those students who had low ACT Natural Science scores.

5. There was no significant difference in the achievement of students in Principles of Accounting I who had high ACT Social Studies scores and those students who had low ACT Social Studies scores.

6. There was no significant difference in the achievement of students in Principles of Management who had high ACT Composite scores and those students who had low ACT Composite scores.

7. There was no significant difference in the achievement of students in Principles of Management who had high ACT English scores and those students who had low ACT English scores.

8. There was no significant difference in the achievement of students in Principles of Management who had high ACT Mathematics scores and those students who had low ACT Mathematics scores.

9. There was no significant difference in the achievement of students in Principles of Management who had high ACT Natural Science scores and those students who had low ACT Natural Science scores.

10. There was no significant difference in the achievement of students in Principles of Management who had high ACT Social Studies scores and those students who had low ACT Social Studies scores.

## Operational Definitions of Variables

This study utilized five independent and two dependent variables.

### Independent Variables

ACT Composite Score--the average of the standard scores, ranging from 1 to 36, on the four academic tests. For this study a score of 22 or above was considered high and a score of less than 22 was considered low.

ACT English Usage Test Score--the raw score converted to a standard score that ranges from 1 to 36. For this study a score of 22 or above was considered high and a score of less than 22 was considered low.

ACT Mathematics Usage Test Score--the raw score converted to a standard score that ranges from 1 to 36. For this study a score of 22 or above was considered high and a score of less than 22 was considered low.

ACT Natural Sciences Reading Test Score--the raw score converted to a standard score that ranges from 1 to 36. For this study a score of 22 or above was considered high and a score of less than 22 was considered low.

ACT Social Studies Reading Test Score--the raw score converted to a standard score that ranges from 1 to 36. For this study a score of 22 or above was considered high and a score of less than 22 was considered low.

### Dependent Variables

Achievement in Principles of Accounting I--the final grade received in the class, based on the following four-point scale: A = 4, B = 3, C = 2, and D = 1. For this study, achievement was assumed to be the attainment of a grade of 3.0 or above.

Achievement in Principles of Management--the final grade received in the class, based on the following four-point scale: A = 4, B = 3, C = 2, and D = 1. For this study, achievement was assumed to be the attainment of a grade of 3.0 or above.

### Definitions of Terms

The following terms were used in this study:

American College Testing (ACT) Assessment Program--"A comprehensive system for information gathering, processing, and reporting designed to help students planning to enter a post-secondary institution" (The American College Testing Program, 1983b, p. 1).

American College Testing (ACT) Assessment Instrument--"A battery of four academic tests, taken under timed conditions, and a Student Profile Section and Interest Inventory, completed when students register for the Assessment" (The American College Testing Program, 1983b, p. 1).

American College Testing (ACT) Interest Inventory--"A 90-item instrument designed to measure students' preferences in six areas: Science, Creative Arts, Social Service,

Business Contact, Business Detail, and Technical" (The American College Testing Program, 1983b, p. 5).

American College Testing (ACT) Student Profile

Section--an instrument designed to gather all of the information a college typically requests on its application form. The student indicates such things as planned enrollment date, planned major, housing needs, biographical data, high school information (including self-reported high school grades in the four subject matter areas covered by the academic tests), etc. (The American College Testing Program, 1983b).

ACT English Usage Test--a 75-item, 40-minute test that measures the student's understanding of the conventions of standard written English: punctuation, grammar, sentence structure, diction and style, and logic and organization (The American College Testing Program, 1983b).

ACT Mathematics Usage Test--a 40-item, 50-minute test that measures the student's mathematical reasoning ability. The test emphasizes quantitative reasoning rather than memory of formulas, knowledge of techniques, or computational skill (The American College Testing Program, 1983b).

ACT Natural Sciences Reading Test--a 52-item, 35-minute test that measures the student's ability to read, analyze, and evaluate material from the natural sciences (The American College Testing Program, 1983b).

ACT Social Studies Reading Test--a 52-item, 35-minute test that measures the student's ability to read, analyze, and evaluate social studies materials (The American College Testing Program, 1983b).

Composite Score--the average of the standard scores on the four ACT academic tests (The American College Testing Program, 1983b).

Grade Point Average (GPA)--the mathematical average of a student's grades. For this study, GPA was based on a four-point scale: A = 4, B = 3, C = 2, D = 1, and F = 0.

Principles of Accounting I--a collegiate-level academic course dealing with gathering, recording, and using financial data of a business.

Principles of Management--a collegiate-level academic course concerned with the planning, organizing, directing, and controlling of a business.

Raw Score--the number of test items answered correctly (Sawyer, 1983).

Standard Score--a conversion of the raw score to a scale that ranges from 1 (low) to 36 (high). This conversion puts the results of the four tests on a common scale and allows the standard score on any one test to be compared with the standard scores on the other tests (The American College Testing Program, 1983b).

Subtest--any of the four academic tests comprising the ACT Assessment.

## CHAPTER II

### REVIEW OF RELATED LITERATURE

This study concerned the use of ACT scores to predict grades in selected business courses. The study was designed to develop a prediction formula that could be used by academic advisers to help students make educational and career choices. All five ACT scores were used as variables in the prediction of grades for two individual business courses at a selected university.

The related research and literature were surveyed with the following purposes in mind: (1) to compare the predictive power of the ACT test with other entrance tests, (2) to compare the predictive power of the ACT scores used alone with the ACT scores used in combination with other variables, (3) to compare the predictive power of the ACT scores when used for different types of students, (4) to compare the predictive power of the composite score and the four subtest scores, (5) to compare the predictive power of the ACT scores when used in relation to different courses or areas of study, and (6) to determine whether ACT scores, in general, should or should not be used to predict academic success.

## Comparison of ACT Scores with Other Test Scores

Researchers have proved the validity of the ACT tests by comparing the ACT scores to the scores made on other types of entrance or intelligence tests. Most researchers found ACT scores to be better predictors of success in college than are other types of scores. Related literature was found comparing the ACT tests scores to the following test scores: Scholastic Aptitude Test, Descriptive Test of Language Skills, Otis I.Q., Proficiency Examination Program, Pre-Professional Skills Tests, and the Survey of Study Habits and Attitudes.

### Scholastic Aptitude Test

Because of their high correlation with academic success, the two most well-known and most widely used predictors of academic achievement for college and university students are the scores of the American College Test and the Scholastic Aptitude Test (Warming, 1976, p. 5).

Several studies have shown the ACT and the Scholastic Aptitude Test (SAT) to be equally predictive. In a study at Brigham Young University, Adams and Others (1976) found that ACT and SAT scores worked equally well for predicting first semester grade point averages for beginning freshmen.

In a study by Aleamoni and Oboler (1977) at a highly selective midwestern university, results suggested that the ACT and SAT are equally able to predict first semester GPA



either alone or in multiple prediction with high school percentile rank.

Munday (1965) found that ACT and SAT tests exhibited about the same degree of predictive validity and that both were better predictors than the SCAT (Educational Testing Service's School and College Ability Tests).

According to Passons (1967), "It does not appear that either the SAT or the ACT clearly surpasses the other in predictive power" (p. 1144).

In another study by Aleamoni and Oboler (1978), the SAT was shown to be a better predictor of first semester college grade point average than the ACT. The results of this study, however, were contradictory to results found by several other researchers.

Westen and Lenning (1973) did a study at the United States Air Force Academy and summarized that ". . . ACT scores can be at least as predictive, and possibly more predictive, of grades at highly selective institutions than are SAT scores" (p. 74).

Results of a study by Lenning and Maxey (1973) suggested that ". . . for most colleges in this sample the ACT tests were at least as efficient predictors of college overall GPA as were the SAT tests" (p. 403).

Lenning (1975) reported on another study concerning four selective colleges where all students had taken both the ACT and the SAT. The evidence pointed to the conclusion that ACT and SAT scores typically yielded similar results;

and where they did not, the ACT was usually favored with higher correlation coefficients.

In a California study, Zimmerman and Michael (1967) compared the criterion-related validities of the ACT, SAT, and the Guilford-Zimmerman Aptitude Survey and found results in favor of the ACT battery.

According to Burros (1972) research at Indiana University showed the validity coefficient for the ACT to be higher than for the SAT.

In summary, all but one researcher either found (1) the ACT and SAT to be equal predictors or found (2) the ACT to be a better predictor than the SAT. The present research study did not include SAT scores as variables. ACT scores were more readily available and past research had shown an equivalency between ACT and SAT scores.

#### Descriptive Test of Language Skills

Snowman and others (1980) made a comparative evaluation of the ability of the four academic tests of the ACT Assessment Program and the Descriptive Test of Language Skills (DTLS) to predict course grades and freshman grade point average for students at a large university. They concluded that

Performance in basic skills courses, notably reading and writing, can be predicted equally well by a subset of the Academic Tests of the ACT Assessment program or a subset of the Descriptive Tests of Language Skills (p. 1165).

In a study that included 496 students at a large mid-western university, Snyder and Elmore (1983a) compared the academic tests of the ACT assessment with the subtests of the Descriptive Tests of Language Skills. The best predictor of cumulative GPA was the ACT composite score, although selected ACT subtests and DTLs subtests yielded statistically significant validity coefficients. "The ACT, already containing three tests which assess reading and language use, appears to be the most valid predictor" (p. 1121).

The present research study did not include the Descriptive Test of Language Skills as a variable since the related literature had shown that the ACT tests could predict college success just as well or better.

#### Otis I.Q.

In a survey of the School of Business at Texas Southern University, Green (1969) found that averages of first-semester freshmen could be predicted when using a combination of the ACT Composite score and the Otis I.Q. score. Therefore, the ACT Composite score was assumed to be just as valid as Otis I.Q. scores at predicting success in college.

#### Proficiency Examination Program

Suddick and Collins (1984) studied the use of the ACT examinations for advanced upper-division placement of nursing students. They reported

The findings of past research and of this study suggest diploma nurses passing the three ACT-PEP

(Proficiency Examination Program) tests are successful in an upper-division BSN (Bachelor of Science in Nursing) program. In fact, they do have higher rates of academic success and lower rates of attrition than do ADN (Associate Degree in Nursing) students not passing three ACT-PEP examinations (p. 723).

The conclusion was reached that ACT scores and Proficiency Examination Program scores were both useful for predicting academic success.

### Pre-Professional Skills Tests

Stoker and Terrab (1984) did a study of 129 students at West Texas State University to see if a correlation existed between certain parts of the PPST (Pre-Professional Skills Tests) and the ACT. The PPST contains three separate tests in reading, mathematics, and writing. The Texas Education Agency mandated these tests as an attempt to guarantee that all future Texas teachers are minimally competent in these three areas. Stoker and Terrab stated "The composite ACT correlated with all three PPST scores and was highest with the total PPST score" (p. 5). They concluded that "Long established ACT scores will, to a large extent, provide reliable measures of student's basic literacy" (p. 5).

### Survey of Study Habits and Attitudes

The Survey of Study Habits and Attitudes (Brown and Holtzman, 1966) was developed as a predictor of academic achievement in college. Wikoff and Kafka (1981) investigated the effectiveness of the SSHA in improving prediction of

achievement and found that "The ACT subtests did a much better job of predicting GPA" (p. 165).

The present research study used ACT test scores as the only variables for predicting academic success and did not include such things as the Survey of Study Habits and Attitudes.

### Summary

Previous research was found comparing ACT scores with scores from the SAT, the Descriptive Test of Language Skills, the Otis I.Q., the Proficiency Examination Program, Pre-Professional Skills Tests, and the Survey of Study Habits and Attitudes. Most all researchers found the ACT scores to be the best predictors. This supported the present researcher's use of the ACT scores, without consideration of other test scores, as the prediction variables.

### Comparison of ACT with Other Variables

For many years, researchers have studied variables that could be used for the prediction of academic success. Two such variables that appeared in many research studies were high school percentile rank and high school grade point average. Many times these variables were used in conjunction with ACT scores.

Research was also found using other variables such as sex, previous experience in the subject, mid-term grades,

number of credit hours taken, number of hours of outside work, size of high school, extracurricular activities, and personality factors. The review of this related literature helped to establish the validity of the ACT test scores when used as prediction variables.

### High School Percentile Rank

Some measure of high school performance, such as cumulative grade point average or percentile rank, is generally the best single predictor of college grades. However, the level of academic achievement required to earn a given grade varies among high schools (Leob and Mueller, 1970, p. 381).

In a study involving 1250 students from 208 high schools, Karp (1967) found that the most important predictor for freshmen GPA was high school rank. Aleamoni and Oboler (1978) also claimed that "high school percentile rank is, by far, the best single predictor of success" (p. 398).

In contrast, Snyder and Elmore (1983b) found that high school percentile rank was not predictive of cumulative GPA at any time for their sample of 496 students at a large midwestern university.

### High School Grade Point Average

As a regular part of the ACT procedure, persons taking the ACT battery report the grades they have received in high school courses in four areas: English, Math, Social Studies, and Natural Science. Research indicates that such self-reported grades correspond closely to high school transcripts and predict college grades as well as high school

reported grades. Maxey (as cited in Montgomery and Duckwall, 1980) summarized the following:

Because the high school grades used by ACT to make predictions are self-reported and cover only four subject areas, they are potentially less effective predictors than overall high school grade average as reported by the high school. The evidence to date, however, indicates that there is not much difference in the predictive validity of these two measures (p. 146).

Halpin and others (1981) found that high school grades predicted college freshmen grades more validly than either the ACT or the SAT. Passons (1967), in his report of nearly 900 Fresno State College freshmen assessed by the ACT, SAT, and high school grades, concluded that high school grades yield the best predictive validity of first-year grades in college. Baird (1969) also reported that for all measures of academic accomplishment, the best predictor was high school grades. But he also said that "The ACT test scores add slightly to the prediction" (p. 425).

Several researchers contend that the best predictor is a combination of ACT scores and high school grade point average. Black (1969) reported that it was possible to predict with reasonable accuracy the grades of college freshmen and sophomores at Chesapeake College using high school grade point average and the four ACT program tests.

In a massive study of over 213,000 students tested nationally, Munday (1968) reported on the potential for predicting college grades using ACT data. He found that both ACT scores and high school grades possess useful predictive

validity and are more efficient when used to supplement each other.

In a study by Richards, Holland, and Lutz (1967) involving 7,208 students at twenty-two colleges, the best single predictor of academic accomplishment was the high school grade point average; however, a better predictor than grades alone was found to be some weighted combination of ACT scores and high school grades.

Halpin, Halpin, and Hauf (1976) examined the effectiveness of the ACT in increasing the validity obtained from using only high school grade point average in predicting success in a three-year nursing program. Employing data collected over a ten-year period, the investigators utilized the index of forecasting efficiency, in addition to multiple correlation procedures. An increase in predictive power greater than 100 percent for each of the three years when the ACT was used to supplement high school grade point average to predict grades in the school of nursing was found by these researchers. They said "Both high school grade point average and ACT scores alone and combined were significantly related to first-second-and third-year grade-point averages of students in the school of nursing" (p. 433).

Maxey (as cited in Montgomery and Duckwall, 1980) reported on a study recently conducted by ACT at 205 colleges that use its predictive research services. The research shows ACT test scores are as effective in predicting freshman grade average as self-reported high school grades, and



using both test scores and self-reported high school grades results in greater accuracy than using either alone. This supports the earlier conclusions drawn by Sawyer and Maxey (1979).

Gell and Bleil (1971) analyzed the relationship between high school grades, ACT scores, and first-semester college grades for 1,379 students at Montgomery College (Maryland). They found that except for one class--a biology class--the ACT scores proved to be better predictors of academic success in college than high school grades.

From another interesting point of view, Keefer (1969) stated "Also at the college level, a direct question of self-predicted GPA was a better predictor of actual GPA than either ACT or high school GPA" (p. 55).

#### Other Predictors

The accurate prediction of academic achievement remains an unsolved problem in education. Such prediction is particularly needed for decision making about college entrance and retention. A search of the literature shows that the quest for variables which will yield valid predictions usually begins with intellectual factors, principally prior grades and test scores, and then may include nonintellectual variables, such as personality traits, cumulative record information, and extra-curricular activities (Keefer, 1969, p. 53).

In order to reduce the 35-40 percent dropout/failure rate in chemistry classes at the Perkinston Campus of Mississippi Gulf Coast Junior College, Mann (1976) studied predictors which would provide early identification of students in need of additional help. He analyzed such things

as sex, ACT composite scores, IQ scores, previous experience in high school chemistry, and mid-term grades. Mann found that ACT scores had the highest predictive value and that sex had almost no value in predicting grades.

McDonald and McPherson (1975) analyzed several variables that could be used to predict college grades. They stated

It was shown that knowledge of high school type, sex, number of credit hours taken, and perhaps dollar value of scholarships and number of hours of outside work could significantly increase the ability to predict grades beyond that accomplished through using rank in high school class and ACT Composite Score (p. 929).

In a study of 205 colleges, Sawyer and Maxey (1982) reported that prediction accuracy was moderately related to the institutional characteristics of affiliation, degree level, and racial/ethnic composition. The predictive validity of ACT scores and high school grades was weakly related to freshman class size of more than 90.

Kline (1984) studied education and business majors at East Texas State University. She indicated that the size of high school was not a significant predictor of ACT composite scores or grade point averages.

Some researchers have analyzed extracurricular activities to see if there was a correlation with grades. Rucker (1985) investigated such things as extent of the students' participation in campus activities; extent of the students' dating; extent of the students' contact with faculty members; and whether or not the students were employed part

time. He concluded that adjustment and many types of social interaction together have a significant relationship with the academic performance of freshman students.

Researchers have also explored the areas of attitude and personality factors as predictors of college success. Snyder and Elmore (1983b) felt that "Student self concept and other personality variables, as well as attitudinal variables may also contribute as student predictors for academic success" (p. 8).

### Summary

The review of literature uncovered many variables that could possibly be used as predictors of grades, including high school percentile rank, high school grade point average, size of high school, previous experience with a subject, extracurricular activities, attitude factors, and personality factors. The present research study used ACT scores as the only prediction variables. The researcher acknowledged the fact that many variables might contribute to the prediction formula; however, the purpose of this study was to determine if ACT scores alone could predict success in business classes.

### Comparison of ACT with Types of Students

For as long as ACT scores have been in use, researchers have studied the validity of the ACT tests when used for different types of students. Related research was found for

(1) junior college students, (2) students from different ethnic groups, (3) male and female students, (4) handicapped students, and (5) students from different socioeconomic levels. Based on the results of this research, the present study did not attempt to categorize the population.

### Junior College Students

Hoyt and Munday (1966) compared the predictive validity of the ACT program for 85 junior colleges with 205 four-year colleges. Junior college students were found to be somewhat less able academically than their peers in four-year colleges. Students in individual junior colleges had more diverse academic talents and more grade variation than was typical of students in four-year institutions. However, Hoyt and Munday concluded that ACT data have highly acceptable validity for predicting academic success in junior colleges.

Black (1969) reported on the efficiency of the ACT as a predictor of achievement at a Maryland junior college. He felt that the possibility existed for prediction with reasonable accuracy of both grades and potential dropouts and probators.

According to Baird (1969) "Academic and nonacademic achievement at two-year colleges can be predicted to a useful degree by the information provided in the ACT Assessment" (p. 429).

In addition to these studies, one researcher found a contradiction. Nolan (1977) conducted a correlational study using ACT subtest scores and actual grades earned in corresponding subject areas in order to determine if the ACT was an effective predictor for student's grades at Southern West Virginia Community College (SWVCC). ACT subtest scores of 241 students were analyzed in relation to the following courses: College Math I, Physical Science I, Biology I, Chemistry I, Western Civilization I, and English I. Nolan said "The correlation analyses yielded coefficients of such low magnitude as to conclude that there is no significant relationship between ACT scores and academic performance at SWVCC" (p. 4).

#### Racial/Ethnic Groups

ACT test scores and self-reported high school grades are accurate predictors of freshman grade average for whites, blacks, and Chicanos. The predictions for whites are somewhat more accurate than for blacks and Chicanos (Maxey, cited in Montgomery and Duckwall, 1980, p. 145).

In a survey of black students, Allen (1978) reported that the ACT may be used by recruiters and admission counselors for predicting academic performance or GPA of first-semester freshmen.

Beasley and Sease (1974) determined that even though biographical or nonintellective data correlated with criterion variables in their study of predictors of academic success, the subscores of the ACT correlated significantly with success. Their findings support the contention that

the ACT predicts as well for blacks as it does for other populations.

However, Pedrini and Pedrini (1976) did not agree. The purpose of their study was to determine the usefulness of the ACT Composite scores in assessing and predicting achievement and attrition of disadvantaged and regular freshmen at the University of Nebraska. They said "ACT scores were effective predictors of college grades among white students, but not among black students" (p. 172).

In a study at New Mexico State University, Zarate (1976) used stepwise multiple regression analysis to determine statistically significant predictors of GPAs. Ethnicity combined with each independent variable was used to examine an interaction in the regression for Mexican Americans. Zarate found that the ACT's Composite and English scores were directly related to GPA and that different regression planes existed for Mexican Americans and Anglo Americans.

Franco and Kaczmarek (1981) also assessed the ACT as a predictor of college success for Mexican Americans. They compared ACT scores and grade point averages for White and Mexican American college graduates. Mexican American students scored lower on both measures, indicating that a correlation existed between grades and ACT scores.

Young (1972) noted that for both minority and non-minority students, low ACT scorers' (1-14) grade point averages were substantially underpredicted. For both minority

and non-minority students, high ACT scorers' (25-33) grade-point averages were substantially overpredicted.

### Sex

ACT test scores and self-reported high school grades are useful predictors of freshman grade average for both males and females. The predictions for females are somewhat more accurate than those for males (Maxey, as cited in Montgomery and Duckwall, 1980, p. 148).

Lavin (1965) reported in his review of research on academic prediction that ability and school performance are more highly correlated for females than for males and that for females absolute performance tends to be higher.

However, Kline (1984) found in her study of business and education majors that male subjects performed at a higher level of achievement than did female subjects.

### Handicapped Students

ACT test scores and self-reported high school grades are useful predictors of freshman grade average for handicapped as well as for non-handicapped students. The predictions for non-handicapped students are somewhat more accurate than for handicapped students (Maxey, as cited in Montgomery and Duckwall, 1980, p. 149).

Maxey went on to say that the differences are not large enough to be significant. However, the results cannot be extended to persons with severe handicaps.

Laing and Farmer (1984) also concluded

It appears that the general prediction equations work equally well for examinees without disabilities and for examinees with disabilities, when both groups take the ACT assessment under regular testing conditions (p. 10).

Bennett, Ragosta, and Stricker (1984, p. 6) reported that "Handicapped students as a general group perform appreciably lower than national norms on the SAT and ACT Assessment (by about .5 standard deviations)." They went on to say "Data on the ACT Assessment support the validity of this measure as an equivalent predictor of college performance among disabled students in general and nonhandicapped examinees" (p. 31).

### Socioeconomic Levels

According to Snowman and others (1980) "The ACT has been shown to be a fairly effective predictor of relevant college outcomes for students of different social classes attending a wide variety of post-secondary institutions" (p. 1160).

Merritt (1972) noted that

The results of this investigation indicate that the ACT can be used to predict the academic performance of college students from low socioeconomic backgrounds who are employed on the Federal Work-Study Program (p. 444).

Pedrini and Pedrini (1977) felt that

Standardized tests, often used, are favorable to middle and upper class persons. Socioeconomic status, financial aid, and employment, taken independently, have not appeared as potent as race or sex in adding to the predictive validity of achievement/aptitude tests scores (p. 289).

### Summary

Previous research has shown that ACT scores can be used as predictors for different ethnic groups, both males and



females, handicapped students, and students from all socio-economic levels. Because of this, the present research study did not attempt to group the population in such categories.

#### Comparison of the Subtests

The present research study used the four ACT subtest scores and the Composite score as the variables to predict grades in business classes. Following is a summary of the related literature that was found on the English Usage Subtest, the Mathematics Usage Subtest, the Natural Science Reading Subtest, the Social Studies Reading Subtest, and the Composite Score.

#### English Usage Subtest

Several researchers found that the English subtest score was a better predictor than the other subtest scores or the composite score. Black (1969) reported "For placement and selection purposes the use of the ACT English test seemed to be amply justified as the scores on this test were good predictors of college grade point average" (p. 28).

Alviani (1974) felt that of the four subtests, English seemed to be the most important followed by social studies.

In a report of a study of 2,289 students, Rowan (1978) said "The ACT English and Social Studies subtests showed the highest correlations to GPA" (p. 149).

Snowman and others (1980) stated "The English Usage and Mathematics Usage tests of the ACT Assessment Program predicted grade-point average" (p. 1166).

Wikoff and Kafka (1981) found that "The ACT subtests having the highest correlation with GPA was English" (p. 163). They also said

The combination of English and math improved prediction slightly over that for the ACT composite score. The social and natural science subtests, however, did not make any further contribution to prediction (p. 165).

These general findings that the English subtest is a good predictor of GPA are also verified by Warming (1976) and by Zarate (1976).

#### Mathematics Usage Subtest

Snowman and others (1980) indicated that "The Mathematics Usage test of the ACT Assessment Program made a significant contribution to prediction" (p. 1165). Elton (1969) had previously found that the ACT Mathematics score was best in predicting educational outcome in females.

After studying business students at Fort Hays, Kansas, Price and Kim (1976) felt that "If only two variables could be used for admission purposes in an undergraduate business program, ACT scores in Social Studies and in Mathematics would be the best candidates" (p. 969).

In predicting grades in a college physics course, Crooks (1980) reported "The mathematics test was the best single predictor of the course mark, accounting for almost

twice as much of the variance as the next best predictor" (p. 9).

However, Alviani (1974) found the math subtest score to be the least important predictor. Black (1969) strongly agreed by saying ". . . since the ACT Math Test is such a poor predictor it might be advisable to consider alternatives in the testing program."

#### Natural Science Reading Subtest

According to Ferguson and Brennan (1979)

Many of the colleges using the ACT tests to develop prediction equations find that the regression analysis conducted show that the Natural Science Reading test usually does not add appreciably to the strength of the prediction of first-year college grade-point average (p. 5).

Halpin, Halpin, and Hauf (1976) found the opposite to be true. They did a validity study of the ACT test battery for predicting success in a school of nursing. Their observation follows:

Another noteworthy finding in this study was the consistently larger validity coefficients across all three years for the ACT Natural Science subscale in relation to those for the other ACT subscales. Critical reasoning and problem solving in scientific settings which the ACT Science subscale supposedly taps are, no doubt, important in nursing school (p. 436).

#### Social Studies Reading Subtest

Previously noted, Rowan (1978) found ACT English and Social Studies subtests had the highest correlations to GPA.

Price and Kim (1976) felt that ACT scores in Social Studies and in Mathematics were good predictors.

Elton (1969) reported that the ACT Social Studies score was the best in predicting educational outcome in males.

A study was undertaken by Hayes and Bradshaw (1977) to quantify the relationship between ACT scores of academic students and final college grade point average. They indicated "The variable that was most closely related to a student's final GPA was the ACT Social Science score" (p. 3).

Villeme and others (1983) studied ways to predict performance on the Florida Teacher Certification Examination (FTCE). They reported that Pearson correlations showed ACT Composite scores and ACT Social Studies scores to be the best overall predictors of FTCE performance.

Warming (1976) did a study of the relationship of variables to achievement in a basic communication skills course. She found that ACT Social Studies alone was not significantly related to the criterion variables.

#### Composite Score

Research proved that the ACT Composite score is one measurement base point which enjoys generally widespread acceptance and credence.

As previously indicated, Zarate (1976) found the ACT Composite and English scores directly related to GPA. Villeme and others (1983) thought the ACT Composite and ACT Social Studies scores were the best predictors.

In a study of a nursing program, Zagar and others, (1982) reported that the ACT Composite score was the most valid predictor of grade point average. They stated

Consistent with past research that found objective measures were significant predictors of graduation from nursing school, the present results demonstrated that the ACT Assessment composite score was the most promising predictor of GPA and of graduation (p. 1173).

### Summary

It should be noted, in summary, that researchers did not agree on which ACT score was the best predictor. Therefore, the present study included all five ACT scores in an attempt to predict grades in selected business classes.

### Comparison of Specific Courses

A study was made by Hendrix (1968) to determine the nature and extent of relationship between total GPA and grades in selected courses with ACT scores and the student's status as high school graduates. Hendrix reported that predictors for individual courses were more accurate than predictors for grade point averages. Maxey (as cited in Montgomery and Duckwall, 1980) agreed that ACT test scores could be used to predict grades in specific freshman courses. However, he felt that these predictions would be slightly less accurate than overall grade-average predictions.

Several researchers have studied the possibilities for predicting grades in certain courses or in certain fields of study. Research on the following areas was found: Accounting, Agriculture, Business, Engineering, English, Foreign Language, Math, Music, Nursing, Science, and Teacher Education.

### Accounting

Decker (1974) tried to determine whether a relationship existed between ACT Composite scores and academic success in Accounting I at Rhode Island Junior College. He said that ". . . the relationship between ACT Composite scores and final grades in Accounting I showed a moderate relationship" (p. 30).

In another study, Brown (1964) reported

There was little relationship between grades assigned by teachers and entrance score averages by classes. This study might indicate that for 'A' or 'B' students, entrance tests add little to information already at hand in the high school grade transcripts (p. 485).

Brown's explanation of this was that "College entrance tests rely to a great extent on retention of high school material, whereas accounting is somewhat of a distinctive field" (p. 483).

### Agriculture

Foster, Daskin, and Seaton (1962) attempted to determine predictability of course grades with the ACT subtests at Kansas State University of Agriculture. The researchers

applied multiple regression techniques to develop prediction equations after analyzing ACT scores for the freshmen enrolled in all courses with enrollments of 100 or more students (nine different course titles).

Foster, Daskin, and Seaton concluded that (1) no one ACT subtest accounts for or predicts success in any one course; and (2) the ability required for success is not always obvious from subtests results.

Their elaboration upon the latter conclusion noted that English subtest scores of their subjects carried more relation to success in calculus courses than did the math subtest and that the social studies subtest carried nearly as much weight as the English subtest in predicting success in English courses. Finally, ACT math and social studies subtests seemed to involve abilities related to a wide range of courses since math scores were included in 14 of 18 prediction equations and social studies in 16 of 18.

### Business

Green (1969), in analyzing academic proficiency of freshmen in a school of business, found that the ACT Composite score was significant in predicting grade point average. He reported

Predicted quality-point averages of first-semester freshmen, School of Business, Texas Southern University, should be accurate 95 percent of the times when based on the combination ACT composite score-Otis I.Q. Score Index with separate scales for (1) Accounting and Business Administration students and (2) Business Education and Office Administration students (p. 3323).

Green also said

The power of the ACT Composite Score-Otis I.Q. score combination in predicting quality-point average would not increase when the School of Business students were subdivided according to (1) sex, (2) Department of Accounting, (3) Department of Business Administration, and (4) upper-and lower-intelligence level.

Price and Kim (1976) investigated the variables influencing student performance in an undergraduate business program hoping to set quantifiable criteria for admissions and counseling purposes. They reported

In general ACT scores are a significant factor in a person's ability to perform in an undergraduate business program. ACT scores were more important in predicting the variation in college performance than were high school grades (p. 968).

Kline (1984) did a study at East Texas State University and concluded that the ACT Composite score was a significant predictor of overall GPA's for business majors.

One contrasting research report was found. In their study at Rhode Island Junior College, Decker and others (1974) concluded that ". . . there is no relationship between ACT Composite scores and Quantitative Business Analysis I final grades.

#### Engineering School

Van Erdewyk's (1967) study of 430 engineering students in North Dakota utilizing the ACT, high school and college grades, and certain demographic data found significant value both in the use of the ACT scores--especially math, social studies, and English--and high school grades.



O'Connor and McAnulty (1981) investigated whether the emphasis on ACT scores for admission to engineering school is justified. Results indicated that ACT scores do aid in predicting academic performance in the freshman year. However, they also indicated that ACT scores should not be used as the sole criteria in determining admission or rejection to an engineering program. O'Connor and McAnulty noted the following observation:

One factor that may have reduced the size of the relationship between ACT scores and GPA's is that some of the predictive ability of the ACT scores had been used in the original process of admission and rejection. The students included in this study were those who had been admitted to the engineering program and had completed their freshman years. Hence the range of the group in both the ACT scores and GPA's were especially restricted at the lower end of the distribution. Students in this study with low ACT scores were not necessarily representative of the entire population of students with low ACT scores who applied to SSS [Speed Scientific School of the University of Louisville, Kentucky] (p. 59).

### English

Both the composite score and subtest scores of the American College Test are used for predictive purposes, either alone or in combination with high school grades. This combination of variables has often been used to place students in appropriate levels in English composition (Buros, 1965, p. 4).

In a study of 51 colleges and universities, Munday (1968) found that ACT English correlated with Cooperative English.

According to Fowler and Ross (1982) "In several modes of analysis scores from the English subtest of the ACT

Assessment yielded the strongest and most pervasive relationship to composition grades" (p. 1107).

Stiggins, Schmeiser, and Ferguson (1978) studied various ACT score combinations to predict students' performance on numerous reading tests at a large number of postsecondary institutions. These studies indicated a high level of predictive accuracy.

Carney and Geis (1981) researched reading ability, academic performance, and college attrition. They stated "The ACT is a better indicator of students' reading ability than students' self-assessment of their own skills" (p. 56).

#### Foreign Language

The prediction of success in college foreign language courses was investigated by Ayers and others (1973). They found the highest correlations between ACT and language grades were obtained for the ACT English and math subtests with English the best predictor. However, they responded that "It appeared that it would not be possible to predict the success of students in beginning foreign language study in college based solely on scores from the ACT" (p. 941).

#### Math

Gell and Bleil (1971) reported on a study of the efficiency of high school grades and ACT scores in predicting academic achievement at a college in Maryland. They found that "When high school grades and ACT scores were correlated

with first semester college grades, the greatest predictive accuracy was obtained for Math 112 and Biology 101" (p. 43).

### Music

A study by Leblanc (1971) was made in the area of music. He concluded that

It is possible, within the limits described in the study, to formulate a procedure for the prediction of college graduation by a matriculant in music or music education using information obtained by application of the ACT Battery (p. 4956).

### Nursing

Two researchers investigated the use of ACT scores to predict performance on the nursing State Board Test Pool Examination (SBTPE). King (1978) found that the ACT Composite was a predictor of successful and non-successful performance on the SBTPE. Juarez (1978) also reported that the ACT was a good predictor of performance on the SBTPE. Juarez decided that "An ACT composite score of at least eleven was required to obtain a passing score on the SBTPE" (p. 1279). Contrary to other results, Juarez found that high school grade point average was not a good predictor of performance.

Other researchers--Halpin, Halpin, and Hauf (1976), Suddick and Collins (1984), and Zagar and Others (1982)--already cited in this study, agreed that ACT scores could be used to predict grade point average and graduation for nursing school students.

## Science

Mann (1976) reported that ACT scores could be used to identify those students in need of special help or additional help in chemistry classes.

Although, Gell and Bleil (1971) found positive predictive results for some classes, they did not find that ACT scores could be used to predict grades in Biology 101.

At Rhode Island Junior College, Decker and others (1974) said

The positive relationship that existed between ACT composite scores and Physical Science grades was so small that the ACT score was concluded to have little usefulness in predicting success in Physical Science (p. 29).

A study by Crooks (1980) indicated that other variables--tests of entering mathematical skills and physics knowledge, and indexes of previous study of mathematics and physics--were better at predicting grades in an introductory college physics course than were college admissions variables (which included ACT Composite, ACT Math, and ACT Natural Science scores). Crooks suggested that prediction of success in particular instructional settings can be substantially improved if skills and knowledge specific to each setting can be identified and measured.

## Teacher Education

Because many states have new laws about teacher education, several recent research studies have attempted to find predictors of successful candidates for teacher education

programs. Kline (1984), previously cited in this study, found that the ACT Composite score was a significant predictor of professional preparation and of GPAs for graduates in education. A study in Florida by Villeme and others (1983) and a study in Louisiana by Tarver and Carr (1983) both report that ACT scores can be used to predict outcomes of teacher certification examinations. Stoker and Terrab (1984) agreed with these findings. They reported

Another implication for Colleges of Education is that ACT results could be utilized more in admission to teacher education and in counseling students who want to be teachers. If additional data and studies substantiate these results, perhaps students should not be considered for a teacher education program unless they can score above a certain ACT level, such as 12, 13, 14, or higher (p. 5).

### Summary

No agreement was found in the cited research studies about whether ACT scores could be used for predicting grades in specific courses or areas of study. The present study was designed to utilize one area--business, and two specific courses--Principles of Accounting I and Principles of Management.

#### Determination of Whether ACT Scores Should or Should Not Be Used for Prediction

Throughout the last three decades, researchers have been establishing the predictive power of the ACT scores. Lester (1963) felt that ACT scores appeared to predict

grade point average. Richards and others (1966), Hoyt and Munday (1966), and Lutz and Richards (1967) reported that both academic and nonacademic accomplishment could be predicted to a useful degree.

At the University of Utah, Worthington and Grant (1971) discovered a moderately good correlation coefficient for ACT scores as predictors of college grades.

Wallace (1972) discovered a correlation coefficient of about .50 for several colleges reviewed. He found that ACT data when coupled with high school grades provided an even better prediction of college grade point average.

In a study at the University of Nebraska at Omaha, Pedrini and Pedrini (1976) said "ACT scores were effective predictors of college attrition/persistence among regular students in large samples" (p. 173).

A sample of 260 colleges was surveyed during the years 1972-1976 to determine the validity of predicting college freshmen grades. Sawyer and Maxey (1978) reported

The quality of the prediction equations are quite stable over the four-year period studied. A similar stability was noted in the accuracy of grade predictions based on males and females separately (p. 19).

Sawyer and Maxey went on to say "Freshmen GPA can in most cases be reliably predicted using equations as old as four years" (p. 19). They also implied that colleges with small student populations could pool data from two or more years when developing prediction equations.

Rowan (1978) substantiated the validity of the ACT for prediction. He stated "ACT validly predicted GPA at yearly intervals over the four year span" (p. 147). Rowan also said "ACT predicted graduation on time" (p. 148).

Maxey (as cited in Montgomery and Duckwall, 1980) stated "The measures of general educational development obtained through the ACT Assessment are accurate predictors of college freshman grades" (p. 145).

Krueger (1981) found that significant relationships existed between basic skills placement and at least 14 factors. Following is a list of the first nine of these items in order of most significant to least significant:

1. ACT Composite Score
2. Cumulative high school grade point average
3. Rank in class of approximately 620 students
4. ACT Social Studies score
5. ACT Science score
6. High school grades in math
7. ACT English Score
8. High school grades in Science
9. ACT Math Score (p. 4).

The validity of the ACT program is documented by Sawyer and Maxey (1982). Their results suggested ". . . that ACT data could be used to make predictions of acceptable accuracy at colleges with as few as 50 freshmen" (p. 4).

From a slightly different viewpoint, Taylor and Dunbar (1983) studied the relationship between ACT scores and the Piagetian cognitive levels of students. They reported

A moderate but significant correlation was found in the relationship of Piagetian score to ACT total score. When an analysis of covariance using piagetian score and ACT total score was conducted, it was found that ACT was a significant predictor of student scores in each category of achievement.

Throughout this review of literature, many other researchers have been cited as agreeing that ACT scores could be used to predict academic success.

A limited number of researchers have found that ACT scores could not be used for prediction. Ayers and others (1973) discovered that ACT scores could not be used to predict success of students in a very specialized area (foreign language).

Davidson (1974) said "ACT scores clearly establish valuable early information about student potential for college performance" (p. 4). However, his study showed that academic performance and persistence was not accounted for by the test scores used in his study:

Alviani (1974) reported that the ACT subtest scores were not able to discriminate between the success groups (GPA of 2.0 or more) or the failure groups (GPA of less than 2.0) in any of the populations surveyed.

In a study at a West Virginia community college, Nolan (1977) concluded that there was no significant relationship between ACT test scores and academic performance.



## Summary

Predicting academic success has long presented an intriguing and challenging problem because discrepancies between predictions and achievement have always existed. Previous research studies have been numerous and diverse, using a variety of techniques and batteries of measures.

Several studies were found comparing the ACT with other entrance or scholastic tests. In almost all studies, the ACT scores either predicted equally as well as the other tests or proved to be the better predictor.

Some other variables were also found to be good predictors of academic success--high school percentile rank and high school grade point average. An even better predictor, though, was a combination of ACT scores with these variables. Other variables were also mentioned, such as sex, IQ scores, previous experience with subject, dollar amount of scholarships, number of hours of outside work, class size, extracurricular activities, and personality factors.

Other studies have shown the ACT to be a fairly effective predictor of GPA for students of different social classes and different ethnic groups attending a wide variety of post-secondary institutions.

The researchers did not agree about which of the ACT scores--English, Mathematics, Natural Science, Social Studies, or Composite--was the best predictor. It seemed to vary depending upon each individual study.

In addition, no agreement was found about whether or not ACT data could be useful for determining the outcomes of students in specific courses or areas of study. ACT scores were found useful in predicting grades in certain courses, in identifying students who needed assistance in certain courses, and in predicting success or failure in certain courses. However, other researchers were not able to find these relationships.

Generally speaking, most researchers decided that ACT scores could be used to predict college grade point average. A few thought that at least the ACT scores could provide some valuable information for placement or guidance. A very limited number of researchers have found that ACT scores could not be used for prediction.

Because of the lack of consensus about which of the ACT scores are the best predictors and about whether prediction can be made for specific courses, this study included these variables.

## CHAPTER III

### RESEARCH DESIGN AND PROCEDURES

This study focused on the use of ACT scores to predict grades in selected business classes. Data were obtained from students' files regarding their final grades in two selected classes and their ACT scores. The data obtained made it possible to show the predictive power of the ACT scores.

The following steps were used in researching the problem, planning the study, gathering the data, and presenting the results of the study concerned with the use of ACT scores to predict grades in selected business courses:

1. Review of related literature
2. Selection of the population
3. Collection of the data
4. Analysis and interpretation of the data
5. Presentation of conclusions and recommendations.

#### Survey of Related Literature

Professional publications and literature dealing with ACT scores were examined to determine if similar studies had been conducted. The literature review was also conducted to

determine the extent of the use of ACT scores for prediction. Sources included ERIC Educational Documents, ERIC Research in Education, Index to Doctoral Dissertations, Tests in Print, the ERIC Data Base, the Dissertation Abstracts Data Base, and numerous professional journals. The researcher was primarily interested in literature published since 1965 because of an ample coverage of the topic during the last 20 years.

#### Selection of the Population

The researcher chose as the population for the study those students graduating in May, 1986, from the College of Business Administration at Oklahoma State University for whom ACT scores and grades in Principles of Accounting I and Principles of Management were available. To be graduated from the College of Business Administration, the student must have completed, in addition to other courses, Principles of Accounting I and Principles of Management and must have received a grade of A, B, C, or D in these courses.

The population was delimited to those students who had ACT data on file. This requirement eliminated students transferring to Oklahoma State University from some other institution, students transferring to the College of Business Administration from some other college, and students not required to take the ACT examination.

## Collection of the Data

Each student's final grade in Principles of Accounting I and Principles of Management was obtained from the records at Oklahoma State University. Also obtained for each student were ACT Composite score, ACT Mathematics Usage score, ACT English Usage score, ACT Natural Science Reading score, and ACT Social Studies Reading score. The grades and ACT scores were made available from the Student Services Office of the College of Business Administration, Oklahoma State University.

Four steps were used to gather data.

### Step 1

A list of the members of the population was compiled from the diploma application cards which had been filled out by all graduating seniors. The Student Services Office had 696 diploma applications.

### Step 2

The file folder of each student on the graduation list was then checked. Out of the list of students, 684 files were found and used to obtain data. Files could not be found for the other 12 students.

Each file folder contained an adviser card. The student's grades and ACT scores, along with other information, were given on these adviser cards. If, however, any

information was missing, an attempt was made to locate that information from another source.

### Step 3

A computer list of all undergraduates in the College of Business Administration was searched to find the ACT scores that had not been placed in the individual files. After checking all possible sources, it was determined that the College of Business Administration at Oklahoma State University did not have ACT scores for 244 of the graduating seniors. Possible explanations for the missing ACT scores include the following: (1) students transferring to Oklahoma State University from another college or university do not report ACT scores; (2) students transferring to the College of Business Administration from another college on the Oklahoma State University campus do not report ACT scores; and (3) some students are not required to take the ACT examination, specifically, international students and non-traditional, older students.

### Step 4

Permanent file folders were searched for any grades that had not been placed on the adviser cards in the individual files. However, 11 students were either missing a grade for Principles of Accounting I or for Principles of Management. Even though both classes were required before the senior college year, these 11 students were currently

enrolled in either Principles of Accounting I or Principles of Management. Most of these students were repeating the course.

The files of two students contained grades of "p" representing "pass" on an advanced standing examination. These two students were eliminated from the study.

After elimination of those students who had incomplete data files--missing files, missing ACT scores, missing grades, or grades of "p"--427 data files remained. This study was based on these 427 graduating seniors from the College of Business Administration at Oklahoma State University, May, 1986.

#### Analysis and Interpretation of Data

As the data were obtained from the student files, they were hand recorded on summary sheets. Data were identified by numbers 1-427 so that individual student names were not recorded. The actual ACT scores, which were numbers that could range from 1 to 36, were recorded for each student.

The student's grades in Principles of Accounting I and in Principles of Management were converted from letter grades of A, B, C, or D to numerical grades. The following scale was used for conversion: A = 4, B = 3, C = 2, and D = 1. If a student had repeated a course, the grades were averaged. For example, a student who made a C in Principles of Accounting I and who then repeated the class and made a B would have an average of 2.5.

Data were keyboarded on a terminal for use in computer tabulations. The qualitative data (ACT scores and grades) were then converted to a coded system for the quantitative analysis of the hypotheses. Achievement in Principles of Accounting I and Principles of Management was assumed to be the attainment of a grade of 3.0 or above. For the analysis, a grade of 3.0 or above was given the code of one. A grade of less than 3.0 was coded with a zero. A high ACT score (22 or above) was given the code of one, and a low ACT score (below 22) was coded as zero.

A Statll Statistical Package was used to do a stepwise multiple regression. This statistical analysis examined the relationship between the dependent variables and the set of independent variables to determine how well the independent variables accounted for variation of the dependent variables. The dependent variables used in the testing of the hypotheses were the grades in Principles of Accounting I and Principles of Management. The independent variables considered in the analyses of data were the (1) ACT English score, (2) ACT Mathematics score, (3) ACT Social Studies score, (4) ACT Natural Science score, and (5) ACT Composite score.

The equation for the full regression model using all the independent variables noted above follows:

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5, \text{ where:}$$

Y = grade in Principles of Accounting I or Principles of Management

$b_0$  = intercept term

$b_1$  = ACT English score



$b_2$  = ACT Mathematics score

$b_3$  = ACT Social Studies score

$b_4$  = ACT Composite score

$b_1 - b_5$  = regression coefficients

The grades in Principles of Accounting I and Principles of Management were analyzed separately to determine if differences existed between the high ACT scores and the low ACT scores.

For each hypothesis, an F value was obtained from the multiple regression. The F value obtained in each case was compared with the tabled F value necessary to indicate significance at the .05 and .01 levels of confidence.

The tabulation and interpretation of the data collection is presented in Chapter IV.

#### Conclusions and Recommendations

Conclusions and recommendations, made on the basis of the findings reported in Chapter IV, are presented in Chapter V.

## CHAPTER IV

### RESEARCH FINDINGS

#### Method of Gathering Data

The findings described in this section were derived from a study conducted at Oklahoma State University during Spring Semester, 1986. The main problem of the study was to determine whether ACT scores could be used to predict grades in certain business classes.

The population for the study consisted of the May, 1986, Oklahoma State University College of Business Administration graduates for whom ACT scores and grades in Principles of Accounting I and Principles of Management were available. For each student the following data were gathered: ACT English score, ACT Math score, ACT Social Studies score, ACT Natural Science score, ACT Composite score, Principles of Accounting I grade, and Principles of Management grade. All data were made available through the Student Services Office in the College of Business Administration.

A list of the members of the population was compiled from the diploma application cards which had been filled out by all graduating seniors. The Student Services Office had 696 diploma applications.

The researcher checked the file folder of each student on the graduation list. Each file folder contained an adviser card. The student's grades and ACT scores, along with other information, were given on these adviser cards. If, however, any information was missing, an attempt was made to locate that information from another source.

After elimination of those students who had incomplete data files--missing files, missing ACT scores, missing grades, or grades of "P"--427 data files remained. This study, therefore, was based on these 427 graduating seniors from the College of Business Administration at Oklahoma State University in May, 1986.

#### Method of Analyzing the Data

As the data were obtained from the student files, they were hand recorded on summary sheets. Data were identified by numbers 1-427 so that individual student names were not recorded. The actual ACT scores, which were numbers that could range from 1 to 36, were recorded for each student.

The student's grades in Principles of Accounting I and in Principles of Management were converted from letter grades of A, B, C, or D to numerical grades. The following scale was used for conversion: A = 4, B = 3, C = 2, and D = 1. If a student had repeated a course, the grades were averaged. For example, a student who made a C in Principles of Accounting I and who then repeated the class and made a B would have an average of 2.5.

All data were then keyboarded into a computer. In order to do a quantitative analysis of each hypothesis, the data were converted from the qualitative grades and ACT scores to a code of one or zero. Achievement in Principles of Accounting I and Principles of Management was assumed to be the attainment of a grade of 3.0 or above. For the analysis, a grade of 3.0 or above was given the code of one. A grade of less than 3.0 was coded with a zero. A high ACT score was assumed to be the attainment of a score of 22 or above and a low ACT score was assumed to be the attainment of a score of less than 22. A high ACT score was given the code of one, and a low ACT score was coded as zero.

A Stattll Statistical Package was used to perform step-wise and multiple regression. Specific findings are presented in the following discussion.

#### Data Analysis

The results of the multiple regression statistical analyses used to test the ten null hypotheses are presented in this section. The general equation for the full regression model using all the variables is:

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5, \text{ where:}$$

Y = grade in Principles of Accounting I or Principles of Management

$b_0$  = intercept term

$X_1$  = ACT English score

$X_2$  = ACT Math score

$X_3$  = ACT Social Studies score

$X_4$  = ACT Natural Science score

$X_5$  = ACT Composite score

$b_1 - b_5$  = regression coefficients

### Analysis of Principles of Accounting I

The null hypotheses numbered 1 through 5 relate to the achievement of students in Principles of Accounting I. Below is a list of the first five hypotheses.

1. There was no significant difference in the achievement of students in Principles of Accounting I who had high ACT Composite scores and those students who had low ACT Composite scores.

2. There was no significant difference in the achievement of students in Principles of Accounting I who had high ACT English scores and those students who had low ACT English scores.

3. There was no significant difference in the achievement of students in Principles of Accounting I who had high ACT Mathematics scores and those students who had low ACT Mathematics scores.

4. There was no significant difference in the achievement of students in Principles of Accounting I who had high ACT Natural Science scores and those students who had low ACT Natural Science scores.

5. There was no significant difference in the achievement of students in Principles of Accounting I who had high

ACT Social Studies scores and those students who had low ACT Social Studies scores.

Multiple regression statistical techniques were used to calculate an F value. The F value obtained in each case was compared with the tabled F value necessary to indicate a difference at the .05 level of confidence and at the .01 level of confidence. The five percent level of confidence indicates that one can be 95 percent confident that the difference is real rather than a result of chance or an accidental phenomenon. The one percent level of confidence indicates that one can be 99 percent confident that the difference is real.

In order to achieve a statistically significant difference between high and low ACT scores, an F ratio of 3.84 was necessary for a .05 percent level of confidence with 1 and 425 degrees of freedom. An F ratio of 6.63 was necessary for a .01 level of confidence.

The ACT scores and the Principles of Accounting I grade for each student are shown in the Appendix, Table III. A summary of the analyses used to test hypotheses 1 through 5 is shown in Table I on page 62.

Hypothesis 1. The analysis of the ACT Composite score used to test Hypothesis 1 produced an F value of 12.6525. That value exceeded the tabled F values of 3.84 and 6.63 necessary to show a significant relationship at the .05 and .01 levels of confidence. The multiple regression analysis showed a statistically significant relationship between the

TABLE I  
 SUMMARY OF MULTIPLE REGRESSION ANALYSES  
 FOR HYPOTHESES 1-5: USING ACT SCORES  
 TO PREDICT GRADES IN PRINCIPLES  
 OF ACCOUNTING I

Hypothesis Number	Type of Score	Degrees of Freedom	F
1	Composite	1, 425	12.6525**
2	English	1, 425	.5845
3	Math	1, 425	54.8835**
4	Natural Science	1, 425	1.1044
5	Social Studies	1, 425	2.2355

\*p < .05  
 \*\*p < .01

independent variable (the ACT Composite score) and the dependent variable (the Principles of Accounting I grade). It was concluded that the ACT Composite score could be used to predict grades in Principles of Accounting I. Hypothesis 1 was, therefore, rejected.

Hypothesis 2. The calculated F value for the ACT English score used to test Hypothesis 2 was .5845 which was less than the table value of 3.84 at the .05 level of confidence. Therefore, the conclusion was reached that there was no significant relationship between the independent variable (the ACT English score) and the dependent variable (the Principles of Accounting I grade). According to these results, the ACT English score could not be used to predict grades in Principles of Accounting I.

Hypothesis 3. The F ratio associated with the ACT Mathematics score to test Hypothesis 3 was 54.8835. That figure exceeded the tabled F value of 3.84 for the .05 level of confidence as well as the tabled F value of 6.63 necessary for the .01 level of confidence. Because the multiple regression analysis showed a statistically significant relationship between the independent variable (the ACT Mathematics score) and the dependent variable (the Principles of Accounting I grade), it was concluded that the ACT Mathematics score could be used to predict grades in Principles of Accounting I. Hypothesis 3 was rejected.



Hypothesis 4. The analysis of the ACT Natural Science score used to test Hypothesis 4 produced an F value of 1.1044. That figure was less than the tabled value of 3.84 at the .05 level of confidence. The multiple regression analysis did not show a statistically significant relationship between the independent variable (the ACT Natural Science score) and the dependent variable (the Principles of Accounting I grade). Therefore, it was concluded that the ACT Natural Science score could not be used to predict grades in Principles of Accounting I.

Hypothesis 5. The F ratio associated with the ACT Social Studies score to test Hypothesis 5 was 2.2355. That figure did not exceed the tabled F value of 3.84 for the .05 level of confidence. Because the multiple regression analysis did not show a statistically significant relationship between the independent variable (the ACT Social Studies score) and the dependent variable (the Principles of Accounting I grade), it was concluded that the ACT Social Studies score could not be used to predict grades in Principles of Accounting I.

Prediction Equation. The equation derived from the results of this study to predict grades in accounting would include the variables of the ACT Mathematics score and the ACT Composite score. The other variables--ACT English score, ACT Social Studies score, and ACT Natural Science

score--would be omitted. The general equation for the regression model would be:

$$Y = b_0 + b_2X_2 + b_5X_5 \text{ where:}$$

$Y$  = grade in Principles of Accounting I

$b_0$  = intercept term

$X_2$  = ACT Mathematics score

$X_5$  = ACT Composite score

$b_2$  = regression coefficient for mathematics score

$b_5$  = regression coefficient for composite score

After substituting the figures derived from the statistical computations in this study, the equation for the prediction of grades in Principles of Accounting I would be:

$$Y = .3636 + .219(X_2) + .196(X_5) \text{ where:}$$

$Y$  = grade in Principles of Accounting I

$X_2$  = ACT Mathematics score

$X_5$  = ACT Composite score

#### Analysis of Principles of Management

The null hypotheses numbered 6 through 10 relate to the achievement of students in Principles of Management. Below is a list of those five hypotheses.

6. There was no significant difference in the achievement of students in Principles of Management who had high ACT Composite scores and those students who had low ACT Composite scores.

7. There was no significant difference in the achievement of students in Principles of Management who had high

ACT English scores and those students who had low ACT English scores.

8. There was no significant difference in the achievement of students in Principles of Management who had high ACT Mathematics scores and those students who had low ACT Mathematics scores.

9. There was no significant difference in the achievement of students in Principles of Management who had high ACT Natural Science scores and those students who had low ACT Natural Science scores.

10. There was no significant difference in the achievement of students in Principles of Management who had high ACT Social Studies scores and those students who had low ACT Social Studies scores.

Multiple regression statistical techniques were used to calculate an F value. The F value obtained in each case was compared with the tabled F value necessary to indicate a difference at the .05 level of confidence and at the .01 level of confidence. In order to be statistically significant, thereby indicating that a relationship probably existed between the independent and the dependent variables, an F ratio of 3.84 was necessary at the .05 level. An F ratio of 6.63 was necessary for a .01 level of confidence.

The ACT scores and the Principles of Management grade for each student are shown in the Appendix, Table III. A summary of the analyses used to test Hypotheses 6 through 10 is listed in Table II on page 67.

TABLE II  
 SUMMARY OF MULTIPLE REGRESSION ANALYSES  
 FOR HYPOTHESES 6-10: USING ACT SCORES  
 TO PREDICT GRADES IN PRINCIPLES  
 OF MANAGEMENT

Hypothesis Number	Type of Score	Degrees of Freedom	F
6	Composite	1, 425	39.2451**
7	English	1, 425	.8931
8	Math	1, 425	7.3074**
9	Natural Science	1, 425	5.8664*
10	Social Studies	1, 425	.2903

\*p < .05  
 \*\*p < .01

Hypothesis 6. The F ratio associated with the ACT Composite score to test Hypothesis 6 was 39.2451. That figure exceeded the tabled F value of 3.84 for the .05 level of confidence as well as the tabled F value of 6.63 necessary for the .01 level of confidence. Because the multiple regression analysis showed a statistically significant relationship between the independent variable (the ACT Composite score) and the dependent variable (the Principles of Management grade), it was concluded that the ACT Composite score could be used to predict grades in Principles of Management. Consequently, Hypothesis 6 was rejected.

Hypothesis 7. The calculated F value for the ACT English score used to test Hypothesis 7 was .8931 which was less than the table value of 3.84 at the .05 level of confidence. Therefore, the conclusion was reached that there was no significant relationship between the independent variable (the ACT English score) and the dependent variable (the Principles of Management grade). It was concluded that the ACT English score could not be used to predict grades in Principles of Accounting I.

Hypothesis 8. The analysis of the ACT Mathematics score used to test Hypothesis 8 produced an F value of 7.3074. That value exceeded the tabled F value of 3.84 for the .05 level of confidence. The F ratio also exceeded the tabled F value of 6.63 necessary for the .01 level of

confidence. The multiple regression analysis showed a statistically significant relationship between the independent variable (the ACT Mathematics score) and the dependent variable (the Principles of Management grade). It was concluded that the ACT Mathematics score could be used to predict grades in Principles of Accounting I. Hypothesis 8 was, therefore, rejected.

Hypothesis 9. There was a significant relationship noted between the ACT Natural Science score and the grade in Principles of Management. Hypothesis 9 was rejected because the calculated F value of 5.8664 exceeded the tabled F value of 3.84 necessary to show a significant difference at the .05 level of confidence. Multiple regression analysis showed a statistically significant relationship between the independent variable (the ACT Natural Science score) and the dependent variable (the Principles of Management grade). The calculated F value, however, was not large enough to show a significant difference at the .01 level. It was concluded that the ACT Natural Science score could be used to predict grades in Principles of Management.

Hypothesis 10. The F ratio associated with the ACT Social Studies score to test Hypothesis 10 was .2903. That figure did not exceed the tabled F value of 3.84 for the .05 level of confidence. Because the multiple regression analysis did not show a statistically significant relationship between the independent variable (the ACT Social Studies

score) and the dependent variable (the Principles of Management grade), it was concluded that the ACT Social Studies score could not be used to predict grades in Principles of Management.

Prediction Equation. The equation derived from the results of this study to predict grades in Principles of Management would include the following variables: ACT Composite score, ACT Mathematics score, and ACT Natural Science score. The variable of the ACT English score and the variable of the ACT Social Studies score would be omitted. The general equation for the regression model would be:

$$Y = b_0 + b_2X_2 + b_4X_4 + b_5X_5 \text{ where:}$$

Y = grade in Principles of Management

$b_0$  = intercept term

$X_2$  = ACT Mathematics score

$X_4$  = ACT Natural Science score

$X_5$  = ACT Composite score

$b_2$  = regression coefficient for mathematics score

$b_4$  = regression coefficient for natural science score

$b_5$  = regression coefficient for composite score

After substituting the figures derived from the statistical computations in this study, the equation for the prediction of grades in Principles of Management would be:

$$Y = .5278 + .143(X_2) + .127(X_4) + .102(X_5) \text{ where:}$$

Y = grade in Principles of Management

$X_2$  = ACT Mathematics score

$X_4$  = ACT Natural Science score

$X_5$  = ACT Composite score

#### Summary

ACT scores were analyzed in two ways using multiple regression. First, all five ACT scores--ACT English score, ACT Mathematics score, ACT Social Studies score, ACT Natural Science score, and ACT Composite score--were analyzed to determine if any significant relationships between ACT scores and grades in Principles of Accounting I existed. Analyses of the score data indicated a significant relationship existed for two of the five independent variables. The ACT Mathematics score was found to have the highest significance in relation to the grades. The ACT Composite score was also found to have a significant relationship to grades in Principles of Accounting I. Multiple regression analyses of the ACT English score, the ACT Social Studies score, and the ACT Natural Science score did not indicate significant relationships existed with the grades in Principles of Accounting I.

Secondly, all five ACT scores were analyzed to determine if any significant relationships between ACT scores and grades in Principles of Management existed. Analyses of the score data indicated a significant relationship existed between the grades and three of the five ACT scores. The ACT Composite score was found to have the highest significance. Also significant in the relationship to Management



grades were the ACT Mathematics score and the ACT Natural Science score. The multiple regression analyses of the ACT English score and the ACT Social Studies score did not indicate any significant relationships with grades in Principles of Management.

## CHAPTER V

### SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Since the early 1920s, collegiate institutions have gathered data on students. Many factors have been employed in an effort to try to predict students' success, failure, or achievement in college. Included among these factors were such individual characteristics as personal motivation, prospects of a high-paying and secure job, study skills, and support from family and friends. However, these characteristics are subjective. In an effort to use quantifiable measures of students' abilities, scores on standardized examinations have become the main predictive variable.

The reliabilities of the ACT tests and the high correlations between the ACT assessment and other similar measures to predict college grades indicated that the ACT battery was a typical measure of academic potential.

#### Purpose and Design of the Study

The problem of this study was an attempt to determine if ACT scores could be used to predict grades in selected accounting and business classes. The study was made by comparing students' ACT scores with their grades in Principles of Accounting I and Principles of Management.

The purpose of this study was to make information available to academic counselors in their role of advising students on course selection.

#### Selection of the Population

The population consisted of those students graduating in May, 1986, from the College of Business Administration at Oklahoma State University who had ACT data on file and who had completed Principles of Accounting I and Principles of Management.

#### Collection of the Data

For each student, the researcher obtained the following information: Principles of Accounting I grade, Principles of Management grade, ACT Composite score, ACT Mathematics Usage score, ACT English Usage score, ACT Natural Science Reading score, and ACT Social Studies Reading score. The grades and ACT scores were made available from the Student Services Office of the College of Business Administration, Oklahoma State University.

#### Analysis of the Data

The data were analyzed with the aid of computer tabulations. Stepwise and multiple regression were performed to examine the relationship between the dependent variables (grades) and the independent variables (ACT scores) in order to determine how well the independent variables accounted

for variation of the dependent variables. Significance of the relationship was determined by comparing the calculated F value with the tabled F value at the .05 and .01 level of confidence.

#### Related Literature

The related research and literature was surveyed with the following purposes in mind: (1) to compare the predictive power of the ACT test with other entrance tests; (2) to compare the predictive power of the ACT scores used alone with the ACT scores used in combination with other variables; (3) to compare the predictive power of the ACT scores when used for different types of students; (4) to compare the predictive power of the composite score and the four subtest scores; (5) to compare the predictive power of the ACT scores when used in relation to different courses or areas of study; and (6) to determine whether ACT scores, in general, should or should not be used to predict academic success.

As presented in the review of related literature, ACT scores were found to predict equally or better than other test scores. The ACT assessment was a fairly effective predictor of GPA for students of different social classes and different ethnic groups attending a wide variety of institutions.

The researchers did not agree about which of the individual ACT scores were the best predictors. Nor did the

previous researchers agree about whether ACT data could be used for determining the outcomes of students in specific courses or specific areas of study.

Overall, researchers have shown that ACT scores could be used to predict college grade-point average. Or, at least, ACT data could provide valuable information for placement or guidance.

This study further extends knowledge of the predictive power of the ACT scores by reporting on the two controversial issues. First, this study reports on the use of the five individual ACT scores--Composite, English Usage, Mathematics Usage, Social Science, and Natural Science--for the prediction of grades. Secondly, this study concentrated on the prediction of grades for one specific area of study (business) and for two specific classes--Principles of Accounting I and Principles of Management.

#### Results of the Study

The results of the study are summarized according to (1) the use of ACT scores to predict grades in Principles of Accounting I, and (2) the use of ACT scores to predict grades in Principles of Management.

#### Prediction of Grades for Principles of Accounting I

Multiple regression analyses of the ACT scores revealed that the ACT Mathematics score and the ACT Composite score

were significant predictors for grades in Principles of Accounting I. Stepwise regression showed that the two scores could be used in combination for the prediction of grades. Of the two scores, ACT Mathematics and ACT Composite, the ACT Mathematics score proved to be the better of the two predictors. Both the Mathematics score and the Composite score were significant at the .01 level of confidence.

Further multiple regression analyses of the ACT scores showed that the ACT English score, the ACT Social Science score, and the ACT Natural Science score were not significant predictors for grades in Principles of Accounting I.

#### Prediction of Grades for Principles of Management

Multiple regression analyses of the ACT scores revealed three significant predictors for grades in Principles of Management. The most significant predictor was the ACT Composite score; the second most significant predictor was the ACT Mathematics score; and the third significant predictor was the ACT Natural Science score. The ACT Composite score and the ACT Mathematics score were significant at the .01 level of confidence, while the ACT Natural Science score was significant at the .05 level of confidence. Stepwise regression showed that the Composite score, the Mathematics score and the Natural Science score could be used in combination to predict grades in Principles of Management.

Further analyses revealed that the ACT English score and the ACT Social Science score were not significant predictors for grades in Principles of Management.

### Discussion of Results

The best predictor of grades in Principles of Accounting I was the ACT Mathematics score. The ACT Mathematics test measured the student's mathematical reasoning ability and this skill was also needed to achieve in accounting. Both mathematics and accounting required quantitative reasoning. The second best predictor of grades in Principles of Accounting I was the ACT Composite score. This relationship indicated that the ACT Composite score was a good general measure of academic achievement and aptitude.

The best predictors of grades in Principles of Management were the ACT Composite score, the ACT Mathematics score, and the ACT Natural Science score. The high correlation with the ACT Composite score indicated that the Composite score was a good overall measure of academic achievement. The relationship between the ACT Mathematics score and the grade in Principles of Management indicated that the reasoning ability needed for mathematics was also needed for management skills. The ACT Natural Science test involves critical reasoning and problem-solving skills which could explain the correlation with the reasoning ability needed for Principles of Management.

## Conclusions

The following conclusions are based on the results of the study of the use of ACT scores for predicting grades in selected business classes and on the review of the related literature.

1. The findings of this study showed a significant relationship between ACT Mathematics scores and grades in Principles of Accounting I. Therefore, the ACT Mathematics score can be used to predict achievement in Principles of Accounting I.

2. The findings also showed a significant relationship between ACT Composite scores and Principles of Accounting I grades. Therefore, the ACT Composite score can be used to predict achievement in Principles of Accounting I.

3. No significant relationship existed between Principles of Accounting I grades and the following ACT scores: English, Social Science, and Natural Science. Therefore, the ACT English score, the ACT Social Science score, and the ACT Natural Science score cannot be used to predict achievement in Principles of Accounting I.

4. The findings of this study showed the best predictor for grades in Principles of Accounting I was a combination of the ACT Mathematics score and the ACT Composite score. Therefore, it was concluded that a combination of the ACT Mathematics score and the ACT Composite score is an effective predictor of achievement in Principles of Accounting I.



5. The findings of this study showed a significant relationship between ACT Composite scores and grades in Principles of Management. Therefore, the ACT Composite score can be used to predict achievement in Principles of Management.

6. The findings also showed a significant relationship between ACT Mathematics scores and Principles of Management grades. The ACT Mathematics score, therefore, can be used to predict achievement in Principles of Management.

7. Another significant relationship was found between ACT Natural Science scores and Principles of Management grades. Consequently, the ACT Natural Science score can be used to predict achievement in Principles of Management.

8. No significant relationship was found between Principles of Management grades and ACT English scores. Also, no significant relationship existed between Principles of Management grades and ACT Social Science scores. As a result, ACT English scores and ACT Social Science scores cannot be used to predict achievement in Principles of Management.

9. The findings of this study showed that the best predictor for grades in Principles of Management was a combination of the ACT Composite score, the ACT Mathematics score, and the ACT Natural Science score. Therefore, the conclusion is that a combination of the ACT Composite score, the ACT Mathematics score, and the ACT Natural Science score

is an effective predictor of achievement in Principles of Management.

#### Recommendations

The following recommendations were made as a result of the findings of this study.

1. Academic counselors should use the information available from this study to advise students on course selection. Some students may need additional coursework in a certain area. Students with low ACT Mathematics scores should be advised to take a math course before enrolling in Principles of Accounting I or Principles of Management.

Students with low ACT Natural Science scores should be advised to take a science class before enrolling in Principles of Management.

2. Students who have low ACT Mathematics scores should be advised about the potential difficulty in achieving success in Principles of Accounting I.

3. Students who have low ACT Composite scores should be advised about the potential difficulty in achieving success in Principles of Accounting I.

4. Students who have low ACT Composite scores should be advised about the potential difficulty in achieving success in Principles of Management.

5. Students who have low ACT Mathematics scores should be advised about the potential difficulty in achieving success in Principles of Management.

6. Students who have low ACT Natural Science scores should be advised about the potential difficulty in achieving success in Principles of Management.

7. Students with lower ACT scores should not be immediately rejected simply on the basis of low scores. Academic and personal records should be further scrutinized for additional indications of possible successful performance.

8. A study should be conducted in which the ACT scores are combined with some other variables--age, sex, rank in class, major classification, overall grade point average--to determine if the discriminatory power of the ACT scores can be increased.

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**APPENDIX**

**DATA TABLE**

TABLE III  
ACT SCORES AND MANAGEMENT AND ACCOUNTING GRADES

Student Number	ACT Eng. Score	ACT Math Score	ACT S.S. Score	ACT N.S. Score	ACT Comp. Score	Mgmt. Grade	Acct. Grade
1	19	18	11	21	17	3.0	2.0
2	26	27	23	26	26	3.0	4.0
3	15	19	23	16	18	3.0	4.0
4	22	20	26	23	23	2.0	1.0
5	17	24	26	24	23	3.0	4.0
6	15	15	8	14	13	2.0	4.0
7	21	22	12	16	18	2.0	2.0
8	19	18	17	22	19	3.0	2.0
9	18	24	10	21	18	1.0	2.0
10	16	9	14	15	14	3.0	3.0
11	21	26	29	25	25	3.0	3.0
12	20	26	22	22	23	3.0	3.0
13	24	22	15	19	20	4.0	3.0
14	27	24	28	29	27	4.0	4.0
15	8	7	10	16	10	2.0	1.5
16	23	30	18	21	23	4.0	3.0
17	22	25	24	16	22	3.0	3.0
18	24	14	25	30	23	4.0	2.0
19	27	28	29	32	29	2.0	4.0
20	21	19	11	25	19	3.0	3.0
21	22	24	25	28	25	3.0	3.0
22	26	32	29	31	30	4.0	3.0
23	19	15	12	19	16	3.0	4.0
24	18	15	18	18	17	3.0	4.0
25	23	25	10	17	19	4.0	3.0
26	18	24	19	26	22	3.0	2.0
27	18	13	25	24	20	2.0	2.0
28	21	27	18	19	21	3.0	3.0
29	22	30	30	30	28	4.0	4.0
30	16	20	25	21	21	3.0	3.0
31	28	22	30	30	28	4.0	4.0
32	21	4	24	24	18	2.0	3.0
33	20	28	30	30	27	3.0	3.0
34	20	25	25	28	25	4.0	4.0
35	30	33	29	26	30	4.0	3.0
36	21	17	22	15	19	2.0	4.0
37	24	26	18	22	24	3.0	3.0
38	21	15	21	28	21	2.0	2.0
39	24	28	23	31	27	4.0	4.0
40	18	14	13	17	16	2.0	1.5
41	19	18	9	18	16	2.0	2.0
42	14	17	16	24	18	3.0	2.0
43	23	27	21	23	24	3.0	2.5

TABLE III (Continued)

Student Number	ACT Eng. Score	ACT Math Score	ACT S.S. Score	ACT N.S. Score	ACT Comp. Score	Mgmt. Grade	Acct. Grade
44	27	28	24	31	28	3.0	2.0
45	24	28	30	29	28	3.0	4.0
46	29	32	27	24	28	3.0	3.0
47	25	25	24	18	23	4.0	4.0
48	28	25	26	26	26	4.0	3.0
49	24	21	29	30	26	1.0	3.0
50	23	25	27	24	25	4.0	4.0
51	7	13	11	15	12	3.0	4.0
52	21	9	23	21	19	3.0	4.0
53	20	23	19	22	21	3.0	3.0
54	30	26	22	25	26	4.0	4.0
55	17	21	31	29	25	3.0	2.0
56	24	26	18	25	23	4.0	4.0
57	21	19	13	16	17	2.0	2.0
58	21	9	10	13	13	3.0	1.0
59	20	18	25	20	21	2.0	3.0
60	23	31	26	26	27	4.0	4.0
61	23	23	23	25	24	3.0	3.0
62	12	12	7	19	13	3.0	1.0
63	24	21	24	30	25	4.0	4.0
64	19	19	29	23	23	4.0	3.0
65	21	25	21	21	23	3.0	3.0
66	11	6	12	15	11	2.0	1.0
67	23	21	27	24	24	3.0	2.0
68	23	16	17	16	18	3.0	3.0
69	15	15	20	24	19	4.0	2.0
70	22	15	24	19	20	2.0	3.0
71	20	24	17	28	22	3.0	3.0
72	22	24	26	24	24	3.0	3.0
73	14	19	20	15	17	2.0	3.5
74	12	17	7	18	14	2.0	2.0
75	22	24	18	18	21	3.0	2.0
76	26	19	30	31	27	3.0	3.0
77	10	22	17	20	17	3.0	3.0
78	24	27	23	21	24	4.0	3.0
79	18	20	21	23	21	3.0	2.0
80	14	20	15	21	18	3.0	2.0
81	18	19	23	25	21	4.0	2.0
82	28	31	23	23	26	4.0	3.0
83	17	16	13	22	17	2.0	2.0
84	28	23	28	28	27	4.0	4.0
85	26	30	27	31	29	4.0	3.0
86	11	18	10	20	15	2.0	2.0
87	21	16	23	21	20	2.0	3.0
88	15	16	18	22	18	2.0	2.0



TABLE III (Continued)

Student Number	ACT Eng. Score	ACT Math Score	ACT S.S. Score	ACT N.S. Score	ACT Comp. Score	Mgmt. Grade	Acct. Grade
89	23	20	25	23	23	3.0	2.0
90	24	25	28	31	27	3.0	2.0
91	18	24	11	25	20	4.0	2.0
92	18	28	19	23	22	4.0	3.0
93	25	20	23	27	24	4.0	3.5
94	14	15	23	24	19	3.0	3.0
95	17	19	22	22	20	4.0	2.0
96	15	16	20	22	18	2.0	1.0
97	23	25	29	22	25	4.0	3.0
98	26	28	28	30	28	3.0	3.0
99	18	22	15	23	20	2.0	2.0
100	25	27	25	29	26	3.0	2.0
101	29	26	24	22	25	3.0	4.0
102	17	27	13	26	21	4.0	3.0
103	19	19	15	26	20	3.0	3.0
104	19	13	15	22	17	4.0	4.0
105	13	10	7	16	12	2.0	2.0
106	23	28	19	17	22	4.0	4.0
107	22	28	32	32	29	4.0	4.0
108	25	22	22	22	23	4.0	4.0
109	16	18	12	21	17	4.0	2.0
110	27	31	28	27	28	4.0	4.0
111	23	23	23	27	24	2.0	3.0
112	15	11	15	20	15	1.0	3.0
113	21	18	21	29	22	3.0	4.0
114	21	20	20	26	22	4.0	4.0
115	16	11	4	11	11	4.0	4.0
116	25	21	16	27	22	3.0	2.0
117	21	22	22	18	21	3.0	3.0
118	23	26	23	29	25	3.0	3.0
119	10	11	10	10	9	2.0	2.0
120	18	21	18	18	19	2.0	1.0
121	26	26	31	30	28	4.0	4.0
122	17	23	18	24	21	3.0	3.0
123	21	25	23	25	24	3.0	3.0
124	28	25	30	31	29	3.0	4.0
125	21	18	10	16	16	3.0	2.5
126	23	25	27	31	27	3.0	2.0
127	18	19	11	17	16	2.0	3.0
128	22	32	19	20	23	3.0	2.0
129	22	27	26	28	26	3.0	1.0
130	22	23	22	18	21	3.0	2.0
131	23	27	29	32	28	3.0	3.0
132	18	25	22	29	24	4.0	3.0
133	11	21	17	17	17	3.0	2.0

TABLE III (Continued)

Student Number	ACT Eng. Score	ACT Math Score	ACT S.S. Score	ACT N.S. Score	ACT Comp. Score	Mgmt. Grade	Acct. Grade
134	21	23	26	30	25	3.0	3.0
135	13	19	17	19	17	3.0	2.0
136	19	19	11	23	18	2.0	1.0
137	18	23	31	29	25	4.0	4.0
138	24	11	24	28	22	3.0	2.0
139	20	6	11	22	15	3.0	2.0
140	15	21	13	23	18	3.0	2.0
141	23	12	17	19	18	4.0	4.0
142	20	18	19	25	21	3.0	2.0
143	21	22	17	23	22	3.0	4.0
144	16	16	17	25	19	2.0	1.0
145	28	22	26	22	25	3.0	4.0
146	21	21	15	20	19	3.0	2.0
147	24	25	29	32	28	4.0	4.0
148	24	14	14	21	18	3.0	3.0
149	18	16	18	20	18	3.0	2.0
150	20	23	19	24	22	3.0	3.0
151	22	27	28	30	27	4.0	4.0
152	15	14	20	20	17	3.0	2.0
153	19	27	25	30	25	2.0	3.0
154	21	21	10	20	18	2.0	4.0
155	17	13	17	23	18	4.0	3.0
156	18	15	12	23	17	4.0	2.0
157	22	18	17	20	19	3.0	2.0
158	23	19	14	19	19	2.0	3.0
159	26	17	25	26	24	4.0	4.0
160	24	26	24	28	26	3.0	1.0
161	17	8	16	15	14	2.0	.5
162	20	18	16	23	19	4.0	3.0
163	23	19	22	24	22	3.0	1.0
164	21	30	30	25	27	4.0	4.0
165	21	10	21	19	18	2.0	2.0
166	24	24	25	28	25	4.0	3.0
167	26	25	21	26	25	4.0	2.0
168	22	26	15	28	23	4.0	4.0
169	12	18	21	20	18	3.0	3.0
170	22	14	31	26	23	3.0	3.0
171	22	18	18	16	19	4.0	3.0
172	28	23	30	27	27	4.0	4.0
173	16	19	24	25	21	3.0	2.0
174	16	18	24	21	20	2.0	1.0
175	21	16	19	16	18	2.0	3.0
176	23	25	17	18	21	4.0	3.0
177	20	26	30	27	26	2.0	3.0
178	13	18	7	15	13	2.0	3.0

TABLE III (Continued)

Student Number	ACT Eng. Score	ACT Math Score	ACT S.S. Score	ACT N.S. Score	ACT Comp. Score	Mgmt. Grade	Acct. Grade
179	25	23	26	22	24	3.0	3.0
180	19	13	23	26	20	3.0	2.0
181	22	22	14	20	20	3.0	4.0
182	19	13	12	15	15	3.0	3.0
183	19	19	19	19	19	2.0	1.0
184	23	18	25	22	22	4.0	3.0
185	23	25	26	27	25	4.0	4.0
186	28	23	31	28	28	3.0	4.0
187	15	19	18	14	17	2.0	1.0
188	26	30	30	33	30	3.0	4.0
189	28	29	24	31	28	4.0	4.0
190	23	20	23	23	21	4.0	2.0
191	21	22	14	23	20	3.0	3.0
192	16	12	19	20	17	3.0	2.0
193	19	8	13	12	13	2.0	2.0
194	14	2	8	21	11	1.0	2.0
195	21	31	15	17	21	3.0	2.0
196	21	22	23	27	23	3.0	4.0
197	21	8	21	24	19	2.0	3.0
198	18	27	17	23	21	2.0	2.0
199	15	19	11	12	14	2.0	2.5
200	20	24	20	26	23	4.0	4.0
201	14	25	19	21	20	2.0	1.0
202	16	26	13	18	18	3.0	4.0
203	26	29	27	31	28	2.0	3.0
204	14	15	17	19	16	3.0	2.0
205	20	27	16	26	23	3.0	3.0
206	18	15	12	23	17	3.0	3.0
207	13	15	10	25	16	4.0	4.0
208	25	25	24	30	26	2.0	2.5
209	22	20	26	21	22	3.0	3.0
210	30	27	29	27	28	3.0	3.0
211	16	12	19	22	17	2.0	2.0
212	19	20	18	21	20	3.0	3.0
213	22	26	29	29	27	4.0	4.0
214	18	10	23	27	20	3.0	.5
215	23	30	26	31	28	3.0	4.0
216	23	32	24	29	27	1.0	4.0
217	12	21	17	17	17	3.0	2.0
218	21	21	26	25	23	3.0	3.0
219	22	22	23	19	22	3.0	3.0
220	21	27	20	24	23	3.0	4.0
221	15	26	18	28	22	4.0	4.0
222	23	21	30	25	25	4.0	4.0
223	6	15	19	10	13	3.0	3.0

TABLE III (Continued)

Student Number	ACT Eng. Score	ACT Math Score	ACT S.S. Score	ACT N.S. Score	ACT Comp. Score	Mgmt. Grade	Acct. Grade
224	23	24	22	20	22	4.0	4.0
225	25	26	24	25	25	3.0	3.0
226	21	26	22	27	24	3.0	3.0
227	22	21	26	27	24	3.0	2.5
228	22	23	22	23	22	2.0	1.5
229	23	33	31	32	30	4.0	4.0
230	23	21	23	23	22	3.0	2.0
231	22	13	21	27	21	4.0	2.0
232	26	20	26	27	25	4.0	4.0
233	15	24	23	20	21	3.0	3.0
234	16	15	16	16	15	3.0	2.0
235	24	23	26	30	26	2.0	2.0
236	19	13	21	21	19	2.0	2.0
237	23	25	25	27	25	3.0	2.0
238	22	24	29	23	25	4.0	4.0
239	15	17	7	14	13	3.0	3.0
240	26	29	26	25	27	3.0	4.0
241	22	26	22	20	23	3.0	4.0
242	30	27	24	31	28	3.0	4.0
243	18	14	17	20	17	3.0	1.0
244	22	24	20	20	22	4.0	3.0
245	15	13	10	16	14	3.0	3.0
246	24	19	18	26	22	3.0	2.0
247	17	25	17	14	18	2.0	2.0
248	22	26	22	24	24	4.0	4.0
249	11	18	15	17	15	2.0	2.0
250	16	11	15	18	15	2.0	3.0
251	17	10	21	18	17	2.0	2.0
252	22	20	27	27	24	3.0	3.0
253	14	14	26	22	19	3.0	2.0
254	22	20	23	24	22	3.0	2.0
255	13	4	22	19	15	2.0	2.0
256	15	9	14	25	16	4.0	4.0
257	22	17	18	22	20	2.0	2.0
258	18	12	19	20	17	4.0	3.0
259	21	24	20	26	23	4.0	3.0
260	22	29	26	19	24	2.0	2.0
261	20	23	20	22	21	3.0	2.0
262	22	24	22	25	23	3.0	4.0
263	21	24	21	21	22	3.0	3.0
264	12	12	14	16	14	4.0	4.0
265	18	24	17	23	21	3.0	3.0
266	20	20	28	30	25	3.0	1.0
267	9	6	14	10	10	2.0	3.0
268	21	24	25	25	24	3.0	3.0

TABLE III (Continued)

Student Number	ACT Eng. Score	ACT Math Score	ACT S.S. Score	ACT N.S. Score	ACT Comp. Score	Mgmt. Grade	Acct. Grade
269	23	21	13	26	21	3.0	4.0
270	16	22	12	22	18	3.0	2.0
271	17	28	31	32	27	4.0	3.0
272	20	21	24	29	24	3.0	1.0
273	24	25	24	29	26	4.0	3.0
274	26	26	23	24	25	3.0	4.0
275	23	20	24	24	23	4.0	3.0
276	20	11	15	24	18	3.0	2.0
277	27	21	28	24	25	3.0	3.0
278	19	21	24	22	22	2.0	3.0
279	14	23	22	21	20	3.0	3.0
280	22	24	26	32	26	3.0	2.0
281	20	25	20	20	22	3.0	1.0
282	27	25	32	27	28	4.0	4.0
283	16	27	14	23	21	3.0	3.0
284	24	28	23	29	26	3.0	4.0
285	23	9	13	22	17	3.0	3.0
286	19	13	24	25	20	3.0	2.0
287	25	23	23	25	24	4.0	1.0
288	21	23	23	28	24	4.0	4.0
289	17	13	16	18	16	2.0	1.0
290	27	26	23	30	27	3.0	3.0
291	28	28	30	32	30	3.0	4.0
292	18	13	15	25	18	4.0	3.0
293	22	19	25	24	23	4.0	4.0
294	29	29	24	28	28	4.0	2.0
295	18	19	14	23	19	2.0	2.0
296	19	10	12	23	16	3.0	3.0
297	15	2	8	12	9	3.0	2.0
298	21	21	18	26	22	3.0	2.0
299	15	12	20	21	17	2.0	3.0
300	24	14	9	25	18	2.0	2.0
301	16	19	13	15	16	2.0	4.0
302	24	18	28	25	24	3.0	2.0
303	22	25	22	22	23	3.0	4.0
304	29	21	20	26	24	2.0	2.0
305	21	29	24	30	26	3.0	3.0
306	24	28	23	23	25	3.0	3.0
307	26	21	21	28	24	3.0	2.0
308	21	18	23	24	22	2.0	3.0
309	20	25	13	23	20	4.0	4.0
310	15	21	23	15	19	2.0	2.0
311	21	26	24	22	23	3.0	3.0
312	19	20	26	27	23	1.0	1.5
313	23	27	28	26	26	4.0	3.0

TABLE III (Continued)

Student Number	ACT Eng. Score	ACT Math Score	ACT S.S. Score	ACT N.S. Score	ACT Comp. Score	Mgmt. Grade	Acct. Grade
314	25	33	28	30	29	4.0	4.0
315	20	23	20	26	22	3.0	3.0
316	22	11	16	23	18	4.0	4.0
317	12	19	22	24	19	3.0	2.0
318	17	17	22	21	19	2.0	3.0
319	8	6	5	12	8	1.0	2.0
320	24	26	11	18	20	4.0	3.0
321	20	17	23	18	20	3.0	2.0
322	24	28	20	28	25	2.0	4.0
323	15	21	18	18	17	3.0	2.0
324	26	23	31	20	27	3.0	3.0
325	24	27	24	24	27	4.0	2.0
326	22	31	28	26	27	4.0	4.0
327	22	17	24	21	21	4.0	3.0
328	21	22	23	27	23	3.0	3.0
329	23	28	26	26	26	4.0	4.0
330	26	27	21	28	26	3.0	2.0
331	8	1	19	15	11	2.0	4.0
332	20	19	24	23	22	3.0	4.0
333	15	20	24	19	20	4.0	2.0
334	22	21	21	25	22	3.0	3.0
335	20	25	24	25	24	3.0	2.0
336	23	17	22	25	22	3.0	3.0
337	23	19	28	30	25	2.0	3.0
338	21	27	24	24	24	3.0	2.0
339	15	22	22	20	20	2.0	1.0
340	22	28	23	27	25	3.0	3.0
341	20	30	25	22	24	2.0	3.0
342	17	18	18	22	19	3.0	1.0
343	14	18	8	14	14	1.0	3.0
344	20	21	25	24	23	4.0	3.0
345	17	27	21	26	23	3.0	1.0
346	22	32	27	31	28	4.0	3.0
347	31	28	26	25	28	3.0	3.0
348	26	28	24	29	27	4.0	3.0
349	32	23	27	29	28	4.0	4.0
350	23	23	17	28	23	3.0	3.0
351	23	23	20	21	22	3.0	3.0
352	20	22	20	24	22	3.0	3.0
353	17	23	17	17	20	3.0	2.0
354	20	26	24	25	24	3.0	2.0
355	25	18	21	17	20	2.0	2.0
356	16	7	17	15	14	3.0	2.0
357	14	21	18	19	18	4.0	4.0
358	22	20	23	21	22	2.0	2.0

TABLE III (Continued)

Student Number	ACT Eng. Score	ACT Math Score	ACT S.S. Score	ACT N.S. Score	ACT Comp. Score	Mgmt. Grade	Acct. Grade
359	21	13	14	24	19	3.0	2.5
360	20	19	22	20	20	4.0	1.0
361	17	16	12	25	18	3.0	3.0
362	20	18	20	21	20	2.0	3.0
363	22	28	24	28	24	3.0	3.0
364	27	33	30	31	30	2.0	4.0
365	20	9	16	28	18	2.0	1.0
366	16	13	22	24	19	3.0	1.0
367	18	26	27	25	24	3.0	2.0
368	17	13	13	20	16	3.0	2.0
396	13	17	11	20	15	3.0	2.0
370	23	19	19	21	21	2.0	.5
371	13	12	14	15	14	2.0	.7
372	23	21	18	27	22	3.0	2.5
373	17	13	18	23	18	3.0	1.0
374	14	13	19	16	16	3.0	1.0
375	15	12	23	16	17	3.0	2.0
376	18	20	26	21	20	2.0	1.5
377	23	27	27	31	27	4.0	3.0
378	24	30	27	29	28	3.0	2.0
379	20	18	10	14	16	2.0	1.0
380	12	11	22	20	16	2.0	2.0
381	20	12	19	28	20	2.0	2.0
382	17	26	27	25	24	3.0	3.0
383	23	26	23	27	25	2.0	1.0
384	29	21	26	29	21	3.0	3.0
385	24	23	25	25	24	2.0	2.0
386	22	24	19	30	24	2.0	2.0
387	17	7	18	15	14	3.0	3.0
388	25	27	19	20	23	3.0	3.0
389	16	22	15	20	18	3.0	3.0
390	19	18	13	15	16	2.0	2.0
391	24	25	23	19	23	3.0	4.0
392	21	21	22	22	22	3.0	3.0
393	15	19	21	19	19	3.0	3.0
394	25	26	26	26	26	1.0	2.0
395	29	26	31	32	30	2.0	2.0
396	24	20	22	26	23	3.0	3.0
397	25	30	28	32	29	2.0	3.0
398	17	19	20	20	19	2.0	1.0
399	20	22	15	13	18	3.0	4.0
400	17	17	14	15	16	3.0	2.0
401	10	19	8	18	14	1.0	1.0
402	13	13	19	21	17	3.0	1.0
403	12	9	13	24	15	3.0	1.0

TABLE III (Continued)

Student Number	ACT Eng. Score	ACT Math Score	ACT S.S. Score	ACT N.S. Score	ACT Comp. Score	Mgmt. Grade	Acct. Grade
404	13	13	10	19	14	2.0	1.0
405	16	21	21	29	22	3.0	1.5
406	25	27	27	32	28	3.0	3.0
407	13	8	7	14	11	2.0	2.0
408	30	33	31	32	32	4.0	4.0
409	16	25	26	25	23	2.0	4.0
410	21	23	27	29	25	3.0	3.0
411	11	22	12	19	16	2.0	1.0
412	21	13	24	23	20	2.0	3.0
413	12	21	14	26	18	2.0	2.0
414	17	23	23	20	21	3.0	2.0
415	21	19	27	32	25	2.0	2.0
416	14	28	16	28	22	3.0	2.0
417	25	29	26	26	27	2.0	2.0
418	22	24	29	30	26	3.0	2.0
419	24	25	26	25	25	3.0	4.0
420	23	11	14	25	18	3.0	1.5
421	22	18	21	27	22	2.0	1.0
422	29	24	28	33	29	3.0	3.0
423	30	30	27	30	29	4.0	4.0
424	18	26	22	25	23	3.0	2.0
425	19	23	15	21	19	3.0	2.0
426	15	20	17	25	17	2.0	1.3
427	20	16	17	17	18	2.0	2.0



2  
VITA

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