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ACT scores of Iowa public high school students: School, student, and family variables

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ACT SCORES OF IOWA PUBLIC HIGH SCHOOL STUDENTS: SCHOOL, STUDENT, AND FAMILY VARIABLES

A Dissertation

Submitted

In Partial Fulfillment

of the Requirements for the Degree of

Doctor of Education

Approved:

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December 1990

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Approved:

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ABSTRACT

The American College Test (ACT) is a nationally normed test developed by the American College Testing program in Iowa City, Iowa. The test battery assesses the aptitude of high school students and is especially important for those students who wish to attend a post-secondary educational institution. The ACT assessment is a comprehensive evaluation, guidance, and placement service for educators and students in the transition from high school to college. This study examined the relationship between ACT test scores and certain selected student, school and family variables.

The sample for this study was the 1986-1987 ACT test taking population of senior public high school students in the state of Iowa. The data tapes of 21,131 public high school students were provided by the American College Testing program in Iowa City, Iowa. The data tape provided information about each public high school student in regard to his/her: (a) ACT composite test score; (b) academic preparation; (c) graduating class size; (d) school district's cost per pupil; (e) ethnicity; (f) gender; (g) class rank; (h) grade point average; and (i) family income level. Descriptive statistics and frequency distributions portrayed the sample. A multiple regression analysis was used to test the relationship between the independent and the dependent variables. The concept of effect size was used to interpret the size of the correlation coefficients. The conventional definitions proposed by Cohen were used: "small" effect size, $r = .10$ and $r^2 = .01$; "medium" effect

size, $r = .3$ and $r^2 = .09$; and "large" effect size, $r = .5$ and $r^2 = .25$.

The analysis of data of this study revealed three variables that were classified as having a "large" effect size. Those three variables were: (a) high school grade point average; (b) high school class rank; and (c) ethnicity. Two variables, academic preparation and gender, produced a "medium" effect size. Family income level and graduating class size were calculated as having a "small" effect size and a school district's cost per pupil was noted as having less than a "small" effect size. High school grade point average, high school class rank, and ethnicity of Iowa public high school students had the greatest relationship to ACT test scores. Family income level, graduating class size and a school district's cost per pupil were found to have very little relationship to ACT test scores of Iowa public high school students.

CHAPTER I

INTRODUCTION

The American College Test (ACT) is a nationally normed test developed by the American College Testing Program in Iowa City, Iowa. The test battery assesses the aptitudes of high school students and is especially important for those students who wish to attend a post-secondary educational institution. The ACT assessment is a comprehensive evaluation, guidance, and placement service for educators and students in the transition from high school to college. Until 1985, a student completing the whole testing program took and completed a Student Profile Section (SPS) and the ACT Interest Inventory (Laing, Engen, & Maxey, 1986). In the fall of 1985, the American College Testing program added the High School Course/Grade Information section which solicits information about the high school courses a student has taken or plans to take, and the grades he/she has earned (Laing, Engen, & Maxey, 1986).

ACT test scores are reported on a standard scale that ranges from 1 to 36. The arithmetic average of the standard scores of the four subtests is called the ACT composite score. It is often used as a measure of overall educational development (Laing, Engen, & Maxey, 1986).

Most colleges and universities require an ACT score or a Scholastic Aptitude Test (SAT) score as part of their entrance requirements. Nationwide, approximately 750,000 students were

expected to take the ACT Assessment examination during this school year (Trend Tables for the ACT Tested Students, 1987).

Statement of the Purpose

According to past research, academic preparation is one of the variables which has the greatest effect upon ACT test scores (Maxey, Cargile, & Laing, 1986). Academic preparation is defined as the total number of core academic courses in the areas of natural sciences, social sciences, mathematics, and English that students take during their high school years (Maxey, Cargile, & Laing, 1986). ACT test scores are more important than ever today--not only in gaining admission to the college of the student's choice, but also for obtaining academic and athletic scholarships (NCAA Guide for the College-Bound Student-Athlete, 1988-89; Ways to Pay for College, 1988-89; Building Your Educational Future, 1988-89; University of Iowa Presidential Scholarship Program, 1988). This study will specifically examine the academic preparation of Iowa public high school students, and it will seek to verify past research on academic preparation and ACT test scores. It is expected that information gained from this research will help counselors, teachers, and administrators guide students and their parents towards making proper decisions regarding certain variables that can affect their ACT test scores. This study differed in that the purpose was to identify variables that could be used to predict ACT scores of Iowa public high school students. It also replicated and extended parts of previous research studies performed on ACT test scores.

Need for the Study

Today, parents, school districts, and colleges strongly emphasize ACT test scores (Building Your Educational Future, 1988-89; NCAA Guide for the College-Bound Student-Athlete, 1988-89; University of Iowa Presidential Scholarship Program, 1988; Ways to Pay for College, 1988-89). Because of the importance of the ACT test, this study extended and replicated parts of other studies and verified past research done on ACT test scores regarding the following variables: gender, ethnicity, family income level, graduating class size, class rank and high school grade point average (Anrig, 1984; Atkins, 1980; Bills, 1977; Ferguson & Maxey, 1976; Harnischfeger & Wiley, 1976; Laing, Engen, & Maxey, 1986; Maxey, Cargile, & Laing, 1986; May, 1978; Maxey, Wimpley, Ferguson, & Hanson, 1976; Munday, 1976; Russo & Checketts, 1978).

This dissertation examines 30 specific academic courses taken by Iowa public high school students and the effect this specific academic preparation has upon ACT test scores. No research to date has examined the 30 specific academic courses utilized in this study. In addition, a study of Iowa school districts' cost per pupil and its effect upon ACT scores was researched to determine if the amount of money spent per student influences the quality of education or affects ACT scores. Cost per pupil has not been examined in previous research.

This current research specifically deals with ACT test scores of 21,131 Iowa public high school students who took the ACT

examination during the 1986-1987 school year. No other studies were found in the research that utilized ACT test scores of only Iowa public high school students; rather ACT studies that examined similar variables for the state of Iowa included scores of private and parochial school students in Iowa. Teachers, administrators, students, and parents in Iowa public education can use the effects of certain studied variables upon ACT test scores to help increase the ACT test scores of future generations of Iowa public school students. In turn, this will help Iowa public high school students gain admission to certain colleges and allow them the opportunity to better compete for certain academic and athletic scholarships.

Statement of the Problem

The broad problem statement for this study was: What variables relate to ACT scores of public high school students in Iowa? Eight specific variables were examined and selected because of their interest to the researcher, the availability of test data for the entire test taking population, and the impact these variables have upon ACT test scores as found in previous research (Bills, 1977; Maxey, Cargile, & Laing, 1986; Laing, Engen, & Maxey, 1986; Russo & Checketts, 1978).

Definitions of Variables

The dependent variable in this study was ACT composite test scores. The ACT assessment examination has four academic subtests: English, mathematics, social studies, and the natural sciences. The four subtests are scored individually using a standard

score that ranges from 1 to 36. A composite score (from 1 to 36) is determined by arithmetically averaging the four subtest standard scores.

The major independent variable in this study was academic preparation of Iowa public high school students. Academic preparation is defined as the number of core academic courses that a student has taken during his/her high school years. Bills (1977) and Laing, Engen, and Maxey (1986) found that academic preparation was one of the most important factors in predicting ACT test scores.

This research paper included three general categories of secondary independent variables also studied by Russo and Checketts (1978): (a) school related variables; (b) student related variables; and (c) a family variable. Secondary independent variables are defined as variables perceived as having a lesser effect upon the dependent variable--the ACT test scores.

School Related Variables

1. Size of Iowa public high school graduating class. The Iowa Department of Education found that students graduating from different sized high school graduating classes achieved significantly different ACT test scores. This information came from data reported by students on the Student Profile Section (SPS) of the ACT battery which asked for the number of students in the graduating class.

2. Iowa public school districts' cost per pupil. Family income levels, as reported nationally, significantly affect ACT scores (Reference Norms for 1987 ACT Tested High School Graduates,

1987). Accordingly, different school districts' cost per pupil may significantly affect ACT scores. The relationship between family income levels and school district cost per pupil indicates that more money available or alloted for education means higher ACT test scores. The cost per pupil per school district of every public school district in Iowa was examined in relation to its pupils' ACT scores. The exact dollar amount was assigned to each corresponding school district. This information was compiled by the Iowa Department of Education.

Student Related Variables

3. Ethnicity of Iowa public high school students. Reference Norms for the 1987 ACT Tested High School Graduates reported that minority students have significantly lower ACT test scores (Reference Norms for the 1987 ACT Test High School Graduates, 1987). Minority groups, such as the NAACP, have questioned ACT test bias. Olion and Olion (1984) stated that assessment instruments such as the ACT examination are not being properly used. They said the tests lack the knowledge of black culture and black communities. Examiners' competency in this area should be closely scrutinized and evaluated (Olion & Olion, 1984). Although specific test bias was not researched in this paper, it does examine ACT test scores according to the ethnicity of the Iowa public high school students taking the ACT examination.

4. Gender of the Iowa public high school students. Reference Norms for 1987 ACT Tested High School Graduates shows a significant

difference in the ACT test scores of male and female students (Reference Norms for 1987 ACT Tested High School Graduates, 1987). Nationally, females achieved an ACT composite test score of 18.6 while males achieved an ACT composite test score of 19.9. This study examined ACT test scores according to gender of the Iowa public high school students taking the ACT examination.

5. Class rank of Iowa public high school students. Maxey, Cargile, and Laing (1986) studied the relationship between ACT test scores and class rank nationally and found significant differences in the ACT test scores of students in relation to high school class rank (Maxey, Cargile, & Laing, 1986). This relationship was examined in this study.

6. Grade point average of Iowa public high school students. Maxey, Cargile, and Laing (1986) also studied the relationship between ACT test scores and grade point average nationally. They found significant differences in the ACT test scores of students in relation to their grade point averages. ACT test scores were examined according to a student's grade point average in this study of Iowa public high school students.

Family Related Variable

7. Family income levels of Iowa public high school students. On a national level, ACT composite test scores increase as family income levels increase (Reference Norms for the 1987 ACT Tested High School Graduates, 1987). The family income level of each student was self-reported in the Student Profile Section (SPS) of

the ACT test. ACT test scores were examined according to a family's income level in this study to better understand the relationship between a family's income level and the effect that income level has upon ACT test scores.

Major Hypothesis to be Tested

The following research hypothesis, which reflected the main independent variable, was tested in this study:

1. A positive relationship exists between ACT composite test scores of Iowa public high school students and their academic preparation.

Supporting Hypotheses to be Tested

The following supporting hypotheses, which dealt with the secondary variables in this study, were also tested:

1. There is a positive relationship between the ACT composite test scores of Iowa public high school students and the size of their high school graduating class.

2. There is a positive relationship between ACT composite test scores of Iowa public high school students and a school district's cost per pupil.

3. There is a relationship between ACT composite test scores and ethnicity of Iowa public high school students.

4. There is a relationship between ACT composite test scores and gender of students in Iowa public high schools.

5. There is a positive relationship between ACT composite test scores of Iowa public high school students and their class rank.

6. There is a positive relationship between ACT composite test scores of Iowa public high school students and their grade point averages.

7. There is a positive relationship between ACT composite test scores of Iowa public high school students and family income levels.

Methodology

The sample for this study was the 1986-87 ACT test taking population of senior public high school students in the state of Iowa. The completed data tape on each student was provided by the American College Testing Program in Iowa City, Iowa. To protect the privacy of individuals and schools, names were omitted on the data tape. Information used to determine or calculate district cost per pupil was added to the data tape prior to deleting student's names and schools. The Iowa Department of Education provided information on school district cost per pupil.

Data Analysis

The data tape was examined and the proper information recorded for the independent and dependent variables. After the data were checked for accuracy, the analysis was performed. Descriptive statistics and frequency distributions portray the sample. A

multiple regression analysis was used to test the relationships between the independent variables and the dependent variables.

Organization of the Study

This study is broken down into five major areas. The first chapter summarizes and explains the ACT assessment examination and its ramifications upon educational programs today. Chapter I also states the purpose of this study, identifies the problem and the hypotheses tested, and defines variables used in the study.

The second chapter deals with the major research related to the ACT assessment examination and the related variables. Information from journal articles, periodicals, dissertations, and theses was reported.

The third chapter describes the methodology in this study, including the subjects, statistical instruments, procedures and final analysis. All basic assumptions are listed in this chapter.

Chapter IV includes all findings of this study regarding the stated dependent and independent variables and tested hypotheses.

The last chapter restates the problem and discusses the study results. It also lists the study's conclusions and all recommendations for future investigation.

CHAPTER II

REVIEW OF LITERATURE AND RELATED RESEARCH

Over the last three decades a great deal of research has been conducted on standardized test scores, particularly regarding the American College Testing program (Atkins, 1980; Laing, Engen, & Maxey, 1986; Maxey, Cargile, & Laing, 1986; Russo & Checketts, 1978). A majority of those studies used ACT scores as a predictor of high scholastic achievement in college, the graduation rate of students, and the prospect's overall success in a job. This study differed in that the purpose was to identify variables that could be used to predict ACT scores of Iowa public high school students.

The search of the related literature included three different examinations of current educational indexes spanning a 24 year period, 1965-1988. An ERIC search was conducted using the following descriptors: American College Testing program or examination, and ACT. Those two major descriptors were then cross-referenced with the following group of adjectives that represented the student variables in this study: family income levels, sex differences, gender differences, class size, class rank, grade point average, and expenditure per student. When those two sets were cross-referenced, the results were: 94 journal articles and 52 doctoral dissertations. That research and other information provided by the American College Testing program in Iowa City, Iowa and the Department of Education for the state of Iowa will be reviewed in Chapter II.

This literature review includes research dealing with student's academic preparation and the effect that has upon ACT test scores. In addition, school related variables, student related variables, a family variable, and other research related to ACT test scores will be summarized.

Academic Preparation

The major independent variable in this study was academic preparation of Iowa public high school students. This area of research, according to some authors (Maxey, Cargile, & Cargile, 1986), has the most significant effect on ACT test scores. This was confirmed during an interview with Dr. James Maxey, Senior Research Scientist for the ACT program. Maxey, Cargile and Laing's (1986) study on academic preparation and its association with performance on the ACT assessment examination found the following: (a) Academic preparation was a significant predictor of ACT test scores for the sample ($p < .05$); (b) The number of courses completed in the academic area was the most important predictor of ACT score for the mathematics and natural science tests. Skills required to do well on these tests are generally gained almost entirely through completion of formal coursework; and (c) In general, the greater the number of courses taken, the higher the average test score. The data suggested that for all sociometric levels, students who complete more courses in a subject area earn higher scores on the ACT assessment examination (Maxey, Cargile, & Laing, 1986).

Laing, Engen, and Maxey (1986) conducted an extensive study of the specific relationship between ACT test scores and high school courses. Their findings concurred with the previously cited study. They found that on the average, students who had taken more coursework scored higher on the relevant test, and that this relationship was most apparent in the areas of mathematics and natural sciences (Laing, Engen, & Maxey, 1986). Results of this study showed that with each full year of math, natural science, social science or English taken there is an increase in the corresponding ACT subtest score, especially in the math and natural science areas (see Figure 1).

Hurst (1984) conducted a similar study in his doctoral dissertation regarding the relationship of allocated time, as measured by high school units, to academic success as measured by the American College Test scores. Hurst found that the number of high school units completed in mathematics, social studies and natural science made significant contributions to the variance in ACT related subtest scores and that the total number of academic units taken in high school contributed significantly to the variance in ACT composite test scores.

Russo and Checketts (1978) performed a multiple regression analysis on the relationship between ACT test scores and eight independent variables (academic courses completed, educational aspirations, school size, class size, number of siblings, birth order, absenteeism, and age spacing). They used beginning freshmen

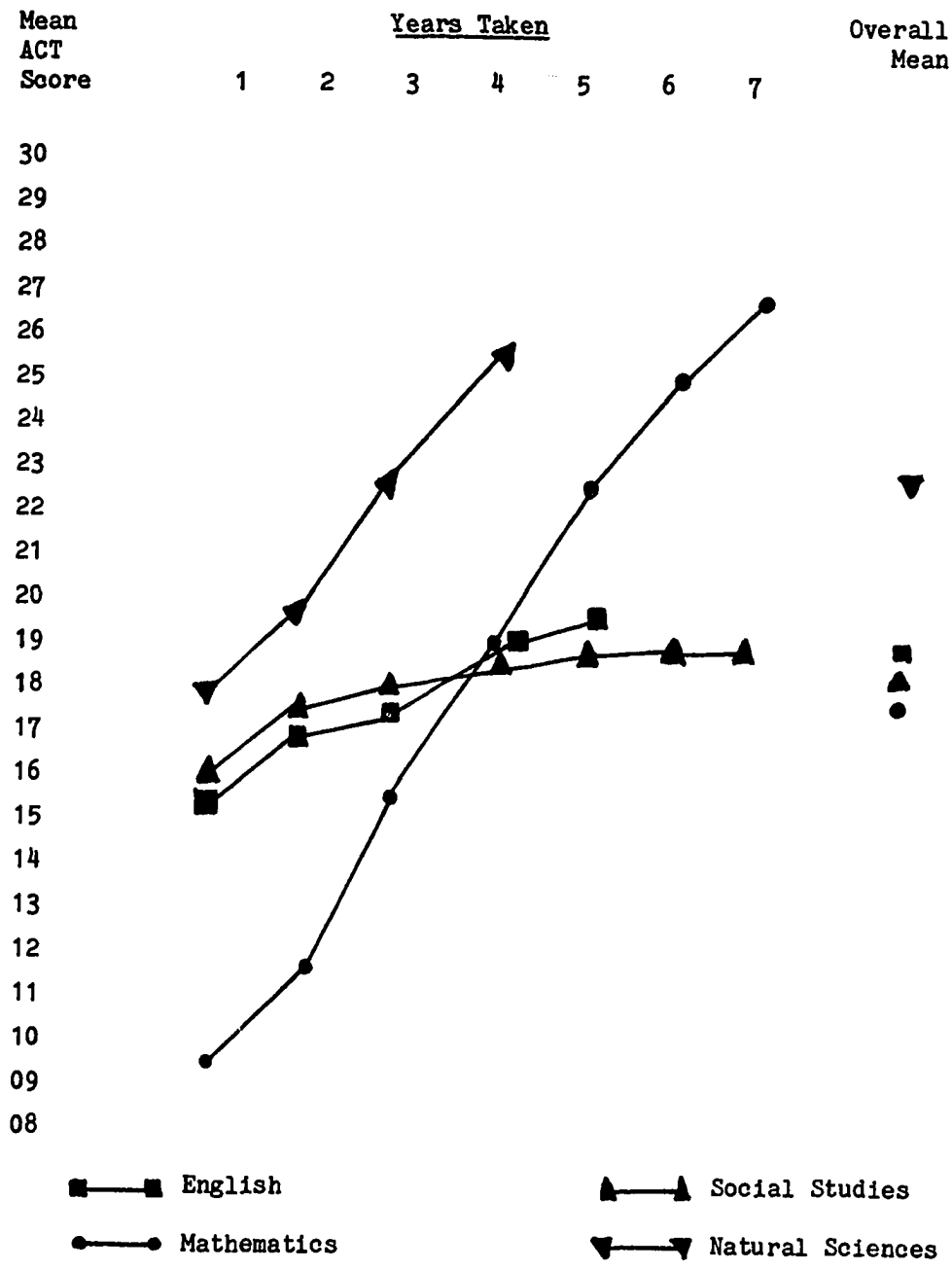

Figure 1. Mean ACT scores by number of courses taken in relevant content area, by area (total group).

at Utah State University as their subjects. The ACT test battery and student self-reported questionnaires were utilized in the study. Of the eight independent variables, academic courses completed had the greatest effect (significant at the .01 level). Educational aspiration, school size, and class size also had the greatest effect upon ACT scores at the .01 level.

David Bills (1977) studied the relationship between ACT test scores and several variables, including the enrollments in academic courses, males and females taking the ACT examination, minorities taking the ACT examination, and high school grade point inflation. In his master's thesis, he stated that the strongest statistical relationship was found between high school enrollment in academic courses and ACT scores. He noted that declines in ACT test scores were directly related to students enrolling in fewer academic core courses. He concluded that high school enrollments in academic courses did have a positive effect upon ACT assessment scores.

Atkins (1980) discussed many specific variables related to ACT test scores. Her research study suggested several factors which may have contributed to ACT score decline between 1966 and 1976. She discovered three major variables which had the greatest effect upon ACT test scores: (a) minorities taking the ACT assessment examination; (b) increased student absenteeism; and (c) decline in the number of academic courses taken by students. She found that students were enrolled in fewer academic core courses (as compared to previous years), and this led to lower ACT test scores.

Secondary Independent Variables

The research on the stated secondary variables in this study will be grouped into the following four areas: (a) School Related Variables, (b) Student Related Variables, (c) Family Related Variables, and (d) Related Research.

School Related Variables

Specifically examined under school related variables were graduating class size and school district cost per pupil.

Graduating class size of Iowa public high school students. The ACT scores of students who graduate from different sized high schools is of great political interest in Iowa today. School reorganization is the call from all across the state and ACT scores are one of the main reasons cited for this trend (Des Moines Register, 1986). Research provided by the ACT program showed that as graduating class size increased so did composite ACT scores--with the exception of the final large school category which showed a slight decline in the ACT composite test scores. Table 1 shows the breakdown of ACT composite test scores by graduating class size, using the six identified categories reported on the Student Profile Section of the ACT assessment examination (Iowa Department of Public Instruction, 1986). Department of Education officials suggested the test score difference had to do with "small classes resulting in lack of competition and interaction among students, and less effective teaching" (Des Moines Register, 1986). Administrators of some of those small schools countered by saying

Table 1

1984-85 ACT Results For Iowa Public Schools

Schools Grouped by Size of Senior Class	Percent of Students Who Took the ACT	Percent of Test-Takers with Average High School Grades of B or Better	Average ACT Composite Score
Less than 25	64%	84%	19.3
25-99	58%	82%	20.2
100-199	57%	78%	20.4
200-399	58%	80%	20.9
400-599	65%	80%	21.4
600 or more	51%	79%	19.9

"scores for smaller schools were lower because a larger percentage of students from their schools took the examinations" (Des Moines Register, 1986).

Iowa public school district's cost per pupil. The district cost per pupil of each Iowa public school district in 1986-1987 was provided by the Iowa Department of Education (1987) in Des Moines and shown in Appendix A.

The literature review and search revealed no specific research done on the relationship between ACT test scores and school district cost per pupil. Because of the lack of research in this area and

its interest to this researcher, this variable was included in the study.

Student Related Variables

Other secondary independent variables examined relate to the four student related variables in this study. These variables originated in the Russo and Checketts study completed in 1978 (Russo & Checketts, 1978).

Ethnicity of Iowa public high school students. The first specific student related variable examined was ethnicity of Iowa public high school students. Most minority student groups (Black-American, Mexican-American, and Native-American) scored lower on the ACT assessment examination than non-minority students on a national level (Reference Norms for 1987 ACT Tested High School Graduates, 1987).

Statistics from the ACT program in Iowa City, Iowa, show that the average ACT composite test score for the 774,444 United States high school graduates who took the ACT is 18.7 (out of a perfect 36). The average ACT score for white students dropped from 19.7 (in 1985-1986) to 19.6 in 1987--falling below Asian-Americans for the first time ever. The average ACT composite test score for blacks rose to 13.4 (Reference Norms for 1987 ACT Tested High School Graduates, 1987).

Other minority groups achieved higher scores than ever before: Asian-Americans 19.8; Native Americans 14.6; and Mexican Americans 15.4 (Reference Norms for 1987 ACT Tested High School Graduates, 1987).

Five studies (Bills, 1977; Breland, 1976; Harnischfeger & Wiley, 1976; Jackson, 1976; McGeever, 1983) examined the ACT composite test scores of minority students. All authors acknowledged that minority students in the United States (as a whole given group) score lower on all standardized tests than the majority white population. McGeever (1983) also found that regional and state ACT test scores for minority students were lower all across the United States, not just in the metropolitan urban centers where the largest minority populations reside.

Vincent (1986) studied the predictors of grades for Black Americans in a Non-Calculus Preprofessional Physics sequence. He found that high school grade point average was the best predictor of grades in the studied course sequence. The accuracy of the prediction could be improved by adding the ACT composite test score (Vincent, 1986).

A National Institute of Education study (1979) examined how well the academic success of black students attending historically black colleges could be predicted. It was found that ACT composite test scores underpredicted the college grade point average of black students. However, the results of the study did not lead to any conclusive statements regarding the validity of the ACT composite test score for predicting college grade point average of black students in selected institutions (National Institution of Education, 1979).

Pedrini and Pedrini (1977) studied the ACT scores of freshman students at the University of Nebraska at Omaha in relation to

certain other variables (race, sex, financial aid, and employment). They performed a correlational variance analysis upon the data and found that the significant assessors of ACT scores are race primarily, and high school grade point average secondarily. Additional assessors, such as sex, financial aid, employment and attrition/persistence, appear unnecessary. Those variables have a lesser effect upon ACT test scores (Pedrini & Pedrini, 1977).

Gender of Iowa public high school students. Nationally males outscored females on the ACT assessment examination given to 1987 high school graduates. The average ACT composite test score for males was 19.5. Females averaged 18.1 (Reference Norms for 1987 ACT Tested High School Graduates, 1987). Males outscored females in three of the four subtest areas (mathematics, natural science, and social studies). Females achieved higher scores in English.

The scoring trend held true in Iowa as well. The average ACT composite test score for males in Iowa was 21.3 in 1986; for females the ACT composite test score average in 1986 was 20.0 (The High School Profile Report, 1986).

Even though males outscore females on the ACT assessment examination, the National Center for Fair and Open testing, a public interest group, produced a report showing that females earn better college grades than males despite lower ACT scores (USA Today, September, 1987).

Seven studies (Bills, 1977; Breland, 1976; Jackson, 1976; May, 1978; Munday, 1976; McGeever, 1983; Waters, 1981) examined

ACT scores of male and female test takers. All authors stated the following conclusions:

1. In general, compared to males, females score lower on most standardized tests.

2. The number and percent of females taking the examination has increased over the years. Of the 1986 Iowa high school graduates who took the ACT assessment examination, 10,496 were male and 11,963 were female (High School Profile Report, 1986). In 1967, 11,479 of the test takers were women and 12,803 were men (State and National Trend Data for Students Who Take the ACT Assessment, 1986).

Phyllis Rosser (1987) maintained that the ACT assessment examination underpredicts the abilities of high school girls--even though females consistently earn higher grades in both high school and college. She contended that these lower scores contribute to a real dollar loss for women in later life as they get less prestigious jobs, earn less money and have fewer leadership opportunities. Test discrimination instills a lifelong low of self-confidence (Rosser, 1987).

High school class rank of Iowa public high school students. The student related variable of class rank was used in a number of studies examined for this paper (Aleamoni & Oboler, 1977; Bowers & Loeb, 1971; Crooks, 1980; Edge & Friedberg, 1984; Hayes & Bradshaw, 1977; Snyder & Elmore, 1983; Thornell & Jones, 1986). Almost all of the studies used class rank as an independent variable which tried to predict: academic success in college, college grade point average, and/or success in a specific college academic program.

These studies did not use class rank to try to predict ACT test scores.

Maxey, Cargile, and Laing (1986) studied class rank in their paper titled, "Three Measures of Academic Achievement and Their Association with Performance on the ACT Assessment." They took a random sample of 37,826 seniors taking the ACT examination and analyzed the effects of class rank upon ACT scores. Using a multiple correlation analysis, class rank was found to be a significant predictor ($p < .05$) of ACT test scores (Maxey, Cargile, & Laing, 1986).

Grade point average of Iowa public high school students. High school grade point average, like class rank, was also used in many studies examined for this paper (Adams, 1976; Black, 1969; Edge & Friedberg, 1984; Halpin, 1981; Hayes & Bradshaw, 1977; Knapp, 1984; Laing & Farmer, 1984; Lenning, 1975; Maxey & Ferguson, 1976; Noble & McNabb, 1989; Richards, 1966; Sawyer & Maxey, 1979; Sawyer & Maxey, 1982; Thornell & Jones, 1986). High school grade point average was utilized as an independent variable to predict: collegiate academic success, college grade point average, and/or success in a specific college academic program. Once again, most of these studies did not use high school grade point average to try to predict ACT test scores.

Maxey, Cargile, and Laing (1986) analyzed high school grade point average as a predictor of ACT test scores. They found that high school grade point average is a significant predictor ($p < .05$) of ACT test scores.

During the 1970s ACT test scores were dropping nationwide. At the same time, grade point averages all across the nation were rising. Maxey and Ferguson (1976), Maxey, Wimpley, Ferguson and Hanson, (1976), May, (1978), and Remingius (1979) examined this trend in relation to ACT scores. Remingius (1979) labeled the trend "grade inflation." Bills (1977) felt that high school grade inflation encouraged less able students to perceive themselves as college material and take the ACT assessment examination. The other authors acknowledged that high school grade point averages were rising during this time period and that ACT composite test scores were declining.

Family Related Variable

The third area of independent variables examined in this study dealt with a family related variable--family income.

Family income levels of Iowa public high school students. The data provided by ACT in Iowa City, Iowa showed a difference in the level of ACT achievement in relation to family income levels. The higher the family income the higher the ACT score (in general) (College Student Profiles: Norms for the ACT Assessment, 1986-1987). ACT research established the following 10 family income groups:

1. Family income of less than $6,000
2. Family income of $6,000 to $11,999
3. Family income of $12,000 to $17,999
4. Family income of $18,000 to $23,999
5. Family income of $24,000 to $29,999
6. Family income of $30,000 to $35,999

7. Family income of $36,000 to $41,999
8. Family income of $42,000 to $49,999
9. Family income of $50,000 to $59,999
10. Family income of $60,000 and over.

ACT composite scores increased with each level of income. ACT uses the above ten family income categories in their Student Profile section but they consolidate some of the information when they report their findings. The results and the consolidated categories are as follows:

1. Family income of less than $11,999--ACT score of 16.7
2. Family income of $12,000 to $17,999--ACT score of 18.4
3. Family income of $18,000 to $23,999--ACT score of 19.1
4. Family income of $24,000 to $35,999--ACT score of 19.9
5. Family income of $36,000 to $49,999--ACT score of 20.6
6. Family income of $50,000 and over--ACT score of 21.1.

(Reference Norms for 1987 ACT Tested High School Graduates, 1987).

It appears that the higher the family income the more educational opportunities can be purchased and that more success on ACT test scores, on the average, can be expected. Harnischfeger and Wiley (1976), Ferguson (1976), and McGeever (1983) all concurred that as family income level rose so did ACT test scores.

Related Research

The vast majority of research that used ACT scores as a variable had to do with the prediction of collegiate academic success and not the prediction of ACT test scores. This research paper examined

the effects that certain variables had upon ACT test scores. This paper did not try to predict collegiate academic success from these researched variables. Seventeen studies (Black, 1969; Halpin, 1981; Hayes & Bradshaw, 1977; Knapp, 1984; Lenning, 1975; Martin & Rudolph, 1972; Maxey, & Ferguson, 1976; McDonald & Phay, 1965; Merritt, 1972; Pedrini & Pedrini, 1977; Rowan, 1978; Sawyer & Maxey, 1979; Sawyer & Maxey, 1982; Snyder & Elmore, 1983; Wikoff & Kafka, 1981; Zarate, 1976) concluded that ACT test scores can be used to predict different forms of academic collegiate success.

Two studies compared ACT scores and SAT scores as predictors of collegiate academic success. These two studies, Adams, 1976, and Aleamoni and Oboler, 1977, found that SAT and ACT scores are equal in ability to predict future academic success.

Six other studies found that other variables (such as high school grade point average, class rank, and other specific academic tests) were better predictors of collegiate academic performance (Bowers & Loeb, 1971; Crooks, 1980; Edge & Friedberg, 1984; Halpin, 1981; Schode, 1977; Snyder & Elmore, 1983; Thornell & Jones, 1986).

A search of doctoral dissertations from across the United States produced similar findings. Most of the research was conducted using ACT test scores to predict academic success in college. The following is a breakdown of the the review.

Sixteen authors of doctoral dissertations found basically the same result in their studies: ACT test scores can be used to relatively predict success in college (as measured by college grade point average, grades in a specific course sequence, college

persistence and awarding of a college degree) (Datri, 1982; Doyle, 1985; Dykes, 1980; Escott, 1980; Helmick, 1983; Hunter, 1984; Jeanotte, 1981; Kitchen, 1986; Levitz, 1982; Malloch, 1981; Oneal, 1980; Smith, 1980; Smith, 1986; White, 1982; Yellott, 1981; Zeller, 1983).

Glover, (1987) noted that the American College Test (ACT) had an insignificant relationship with college grade point average for students who did not complete 45 hours of college credit. Riblett (1980) suggested that high school science classes and participation in science research (Independent Study) should be substituted for the ACT test score when it comes to issuing college scholarships.

Summary

The review of professional literature, including journal articles, dissertations and other professional papers was divided into several sections. The first section dealt with the major independent variable--academic preparation. Four categories of research on the secondary independent variables followed. They included: (a) School Related Variables, (b) Student Related Variables, (c) Family Related Variables, and (d) Related Research. The last category examined related research on ACT scores.

According to recent research, the amount of a student's academic preparation had the greatest effect upon ACT scores (Bills, 1977; Maxey, Cargile, & Laing, 1986; Russo & Checketts, 1978). The effects of the secondary variables on ACT scores are not as clear. There is no concise agreement that these variables can significantly influence ACT test scores. The related research section showed

that the majority of studies proved statistically that ACT test scores can be used to predict future academic success.

CHAPTER III

METHODS

Description of Subjects

The subjects in this research project included all Iowa public high school students who took the ACT assessment examination during the 1986-1987 school year, totaling 21,131. The American College Testing program in Iowa City, Iowa, provided the test data.

Instrumentation

The instrumentation for this study was the Student Profile Section of the ACT and the High School Course/Grade Information Section, developed by the American College Testing program. The Student Profile Section asks for information about a student's background, interests, needs, and plans. It includes 190 questions that the student answers on page 3 of the registration folder.

The High School Course/Grade Information Section was added by the American College Testing program in 1985. It solicits information about the courses a student has taken or plans to take in high school and the grades he/she has earned. The information for this section is collected on page 2 of the student's registration folder.

All tested students completed the ACT Student Profile Section and the High School Course/Grade Information Section which collected data in regard to the independent variables used in this study.

The major independent variable was academic preparation of Iowa public high school students. On the High School Course/Grade

Information Section of the ACT examination, students reported the high school courses they had completed or planned to complete prior to graduation. This section of the ACT examination lists courses in 6 curriculum areas. The 6 curriculum areas and courses in each area are: English: 9th grade English, 10th grade English, 11th grade English, 12 grade English, and Speech.

Mathematics: Algebra I, Algebra II, Geometry, Trigonometry, Calculus, other math courses beyond Algebra II, and Computer Math or Computer Science.

Natural Science: General/Physical/Earth Science, Biology, Chemistry, and Physics.

Social Studies: U.S. or American History, World History, other History (European, State, etc.), American Government/Civics, Economics, Geography, Psychology, and Consumer Economics.

Language: Spanish, French, German, or other languages.

Arts: Art, Music, and Drama/Theater.

Possible scores a student could achieve in English were 0-4, in mathematics 0-6, in the natural sciences 0-3, in the social sciences 0-7, in foreign language 0-3, and in the arts 0-2. A total academic preparation score for each student ranged from 0 to 25.

The secondary independent variables included:

School Related Variables

1. Size of Iowa public high school graduating class. Student-reported data on the Student Profile Section (SPS) of the

ACT battery included the number of students in the graduating class. The sample was sorted into the following 6 high school graduating class size groups:

0. 25-99 students
1. 100-199 students
2. 200-399 students
3. 400-599 students
4. 600-899 students
5. 900 or more students.

Thus, each student had a score of 0 through 5 on this measure with 0 equaling 25-99 students . . . and 5 equaling 900 or more students in the graduating class.

2. The Iowa public school district's cost per pupil. The cost per pupil per school district for every Iowa public school district was examined in relation to its pupils' ACT scores. The exact dollar amount was assigned to each corresponding school district. The Iowa Department of Education compiled this information and provided it to this researcher. The information was then sent to the American College Testing program in Iowa City, Iowa. Dr. James Maxey annexed that information to the magnetic data tapes that all ACT test scores were recorded on and that ACT provided for this research project. Dr. Maxey matched the proper cost per pupil information to the proper public school district.

Student Related Variables

3. Ethnicity of Iowa public high school students. In this study, ACT test scores were examined according to the ethnicity of the Iowa public high school student taking the ACT examination. This information was self-reported on the Student Profile Section (SPS) of the ACT test. The following categories were used:

0. Afro-American/Black
1. American Indian, Alaskan Native
2. Caucasian-American/White
3. Mexican-American/Chicano
4. Asian-American, Pacific Islander
5. Puerto Rican, Cuban, other Hispanic origin
6. Other
7. I prefer not to respond.

For purposes of hypothesis testing, all minority groups were coded zero and students reporting themselves as Caucasian-American/white were coded as one.

4. Gender of Iowa public high school students.

Scores of Iowa public school males and females taking the ACT test battery were studied. This information was self-reported in the Student Profile Section (SPS) of the ACT test. Zero represented a male and one represented a female.

5. Class rank of Iowa public high school students. The students taking the ACT test identified themselves as being in:

0. The top quarter of their graduating class.

1. The second quarter of their graduating class.

2. The third quarter of their graduating class.

3. The fourth quarter of their graduating class.

Thus, each student had a score of 0-3 on this measure with 0 equaling the top quarter of their graduating class, 1 equaling the second quarter of their graduating class, 2 equaling the third quarter of their class, and 4 equaling the fourth quarter of their graduating class.

6. Grade point average of Iowa public high school students. ACT test scores were examined according to a student's grade point average in this study. Data reported by students on the Student Profile Section (SPS) of the ACT battery included the following seven grade point categories:

0. 0.5 to 0.9

1. 1.0 to 1.4

2. 1.5 to 1.9

3. 2.0 to 2.4

4. 2.5 to 2.9

5. 3.0 to 3.4

6. 3.5 to 4.0

Students were instructed to indicate which category contained their current grade point average. Each student had a score of 0-6. Zero (0) equaled a grade point average of 0.5 to 0.9, . . . and 6 equaled a grade point average of 3.5 to 4.0.

Family Related Variable

7. Family income levels of Iowa public high school students. The family income level of each student was self-reported in the Student Profile Section (SPS) of the ACT test. The income levels, as reported in the Student Profile Section (SPS), were sorted into the following ten categories:

0. Less than $6,000
1. $6,000 to $11,999
2. $12,000 to $17,999
3. $18,000 to $23,999
4. $24,000 to $29,999
5. $30,000 to $35,999
6. $36,000 to $41,999
7. $42,000 to $49,999
8. $50,000 to $59,999
9. $60,000 and over

Each student could score zero (0) through nine, with zero (0) representing a family income of less than $6,000 . . . and 9 equaling a family income level of $60,000 and over.

Major Hypothesis to be Tested

The following research hypothesis was tested in this study:

1. There is a positive relationship between ACT composite test scores of Iowa public high school students and their academic preparation.

Supporting Hypothesis to be Tested

The following supporting hypothesis, which dealt with the secondary variables in this study, were tested:

1. There is a positive relationship between ACT composite test scores of Iowa public high school students and the size of their high school graduating class.

2. There is a positive relationship between ACT composite test scores of Iowa public high school students and a school district's cost per pupil.

3. There is a relationship between ACT composite test scores and ethnicity of Iowa public high school students. (Minority students were coded zero and Caucasian-American/White students were coded as one.)

4. There is a relationship between ACT composite test scores and gender of students in Iowa public high schools. (Male students were coded as zero and female students were coded as one.)

5. There is a positive relationship between ACT composite test scores of Iowa public high school students and their class ranks.

6. There is a positive relationship between ACT composite test scores of Iowa public high school students and their grade point averages.

7. There is a positive relationship between ACT composite test scores of Iowa public high school students and family income levels.

Procedure

During March, 1987, in a personal interview with Dr. James Maxey, Senior Research Scientist for ACT, permission was granted to use ACT's data tapes for this research project. It was agreed that all personal names and school district names would be removed from the tapes prior to their being sent to this researcher.

In December, 1987, the Department of Education for the state of Iowa was asked to provide school district's cost per pupil for each public school district in the state of Iowa. This was done in January, 1988 and that information was forwarded to Dr. James Maxey in February, 1988.

Dr. Maxey annexed the Department of Education's information to the ACT data tapes and then removed all personal names and school district names from the tapes. The tapes were then sent to this researcher in April, 1988.

The completed ACT data tapes were taken to the University of Northern Iowa computer service center in Baker Hall. Mary Howard identified the coded fields on the magnetic data tape utilized in this research project, and a computer extracted all of the related

information from the data tapes. All pertinent data were then transcribed from the data tapes and entered into a computer for use in the analysis section of this research study.

Statistical Analysis

Since this study examined the relationship of several variables and the effect each had on ACT test scores, a multiple regression analysis was used. This type of analysis allows one to examine the relationship between two or more independent variables and a dependent variable and attempts to find the best linear prediction equation and evaluate its prediction accuracy. In addition, a Stepwise analysis was also performed on the data. The Stepwise analysis removes the independent variable whose F value has the largest probability associated with the null hypothesis. The regression equation is then recomputed. The next independent variable with the largest P-value is removed, and the stepwise process is repeated until all of the independent variables are significant at the .05 level. In the end, a list of independent variables is compiled from the most significant independent variable to the least significant independent variable.

Means, frequencies, and correlations for the variables included in the regression analysis are presented in Chapter IV.

Basic Assumption

Several assumptions have been made in the present study, including the following:

1. Each tested individual answered honestly in the self-reporting of pertinent information used in this study.

2. There is a negligible amount of non-respondents in the data collected.

3. All information annexed to the original data tapes was annexed correctly.

Limitations and Scope

The present study was limited in its investigation to only the public high school students in the state of Iowa.

CHAPTER IV

ANALYSIS OF DATA

Introduction

The results of the statistical analysis of data are presented in this chapter. The hypotheses tested in this study are stated individually, and the pertinent statistical findings immediately follow each one. The .05 level of significance was designated for rejecting the hypotheses in this study.

The subjects utilized in this study included all Iowa public high school students who took the ACT examination during the 1986-1987 school year. The total population tested included 21,131 students. For this study a multiple regression analysis and a Stepwise multiple regression analysis were used.

Chapter IV is arranged into two sections. The first section addresses the major problem of this study and the second section reports the sub analyses.

Problems and Findings of the Study

The major problem of this study was to determine what variables relate to ACT scores of public high school students in the state of Iowa. To address this problem Table 2 reports the means and standard deviations and Table 3 reports the correlations. To interpret the size of the correlation coefficients, the concept of effect size was used. The conventional definitions, proposed by Cohen (1977), were used, namely "small" effect size, r = .10 and

Table 2

Means and Standard Deviations for the Variables Included in the Multiple Regression Analysis (N = 21,131)

Variable	Mean	SD
ACT Composite Score	20.279	5.286
District Cost Per Pupil	3213.659	264.670
Gender	.465	.499
Income Levels	4.191	2.446
Ethnicity	3.129	.836
Class Size	3.111	1.249
Class Rank	1.750	.779
Grade Point Average	5.363	1.216
Academic Preparation	13.939	3.175

r^2 = .01; "medium" effect size, r = .3 and r^2 = .09; and "large" effect size, r = .5 and r^2 = .25.

Research Hypotheses of the Study

Academic Preparation of Iowa Public High School Students

Research Hypothesis: There is a positive relationship between ACT composite test scores and academic preparation. As shown in Table 3, r = .317 (p = .01), which is a "medium" effect size. Thus, the data supports the research hypothesis.

Table 3

Correlations for the Variables Included in the Multiple Regression Analysis

Variable	ACT Composite Test Scores	Academic Preparation	Graduating Class Size	Class Rank	Family Income Level	Grade Point Average	Cost Per Pupil
ACT Composite Test Scores	1.000						
Academic Preparation	.317	1.000					
Graduating Class Size	.076	.067	1.000				
Class Rank	-.577	-.246	.051	1.000			
Family Income Levels	.156	.120	.298	-.058	1.000		
Grade Point Average	.617	.276	-.001	-.752	.077	1.000	
Cost Per Pupil	-.040	.002	-.021	.009	-.064	.003	1.000

Size of Iowa Public High School Graduating Class

Research Hypothesis: There is a positive relationship between ACT composite test scores and the size of a student's high school graduating class. As shown in Table 3, r = .076 (p = .01), which is a "small" effect size. Thus, the data weakly supports the research hypothesis.

Iowa Public School District's Cost Per Pupil

Research Hypothesis: There is a positive relationship between ACT composite test scores and a school district's cost per pupil. As shown in Table 3, r = -.040 (p = .01) which is below the threshold of the "small" effect size as established by Cohen (1977). Thus, this data does not support the research hypothesis.

Ethnicity of Iowa Public High School Students

Research Hypothesis: There is a relationship between ACT composite test scores and ethnicity. As shown in Table 4, ACT composite test scores of Asian and white Iowa public high school students are approximately the same. The ACT composite test scores of white and black Iowa public school students are separated by 5.44 points. This represents a "large" effect size (r = 1.049). The sample sizes of Puerto Rican, Indian, and Mexican students were too small to justify further analysis and interpretation.

Gender of Iowa Public High School Students

Research Hypothesis: There is a relationship between ACT composite test scores and gender. As shown in Table 5, Iowa public high school males average ACT composite test score is 1.3 points

Table 4

Means and Standard Deviations of ACT Composite Test Scores of Iowa Public High School Students During the 1986-1987 School Year, by Ethnicity (N = 21,131)

	N	Mean	SD
Caucasian/White	19,427	20.48	5.185
Asian	214	19.40	6.839
Mexican	109	18.18	5.442
Other	279	18.11	5.106
Puerto Rican	28	17.54	6.415
Indian	77	16.57	5.072
Black	280	15.04	5.162

Table 5

Means and Standard Deviations of ACT Composite Test Scores of Iowa Public High School Students During the 1986-1987 School Year, by Gender (N = 21,131)

	N	Mean	SD
Males	9,831	20.98	5.299
Females	11,300	19.67	5.199

higher than females. This represents an effect size of .25. Thus, the data supports the research hypothesis.

Class Rank of Iowa Public High School Students

Research Hypothesis: There is a positive relationship between ACT composite test scores and a student's class rank. As shown in Table 3, $r = -.577$ ($p = .01$), which is a "large" effect size. Thus, class rank accounts for about 25% of the variance in ACT composite test scores.

Grade Point Average of Iowa Public High School Students

Research Hypothesis: There is a positive relationship between ACT composite test scores and a student's grade point average. As shown in Table 3, $r = .617$ ($p = .01$), which is a "large" effect size. Thus, the data support the research hypothesis.

Family Income Levels of Iowa Public High School Students

Research Hypothesis: There is a positive relationship between ACT composite test scores and family income levels. As shown in Table 3, $r = .156$ ($p = .01$). Thus, the data support the research hypothesis, but the effect size is "small."

Multiple Regression Analysis of the Study

To further investigate the major problem of this study a multiple regression analysis was computed to test the relationship between ACT composite test scores and the eight independent variables described in the hypotheses stated above. This multiple regression analysis produced a regression coefficient of .695 when the ACT composite test scores were predicted from the eight independent variables. Table 6 summarizes the analysis of data.

Table 6

Multiple Regression Analysis for the Relationship Between ACT Composite Test Scores and Seven Background Variables of Iowa Public High School Students

Dependent Variable--ACT Composite Test Scores (N = 21,131)	
Variable Entered	Beta Weights
1. Academic Preparation	.159
2. Class Rank	-.237
3. Cost Per Pupil	-.031
4. Gender	.188
5. Grade Point Average	.413
6. Graduating Class Size	.054
7. Family Income Levels	.061
Analysis of Variance	
R^2 = .483	

As can be seen from the Beta weights, four major factors contributed to predicting ACT composite test scores: grade point average, high school class rank, gender of students taking the test, and academic preparation (defined as the number of core academic courses taken). Beta weights are the regression weights in a multiple regression equation in which all variables in the

equation are in standard score form (Borg & Gall, 1983). The other four variables contributed the least to predicting ACT composite test scores, namely: family income levels, graduating class size, school district cost per pupil, and ethnicity of Iowa public high school students.

Sub-Analyses of the Study

The following three sub-analyses were also performed: What specific curriculum areas affected ACT scores? What specific courses affected ACT scores? What is the smallest set of variables that make meaningful contributions to ACT scores?

To investigate the first sub-analysis a multiple regression analysis was performed upon the data which delineated academic preparation (number of core academic courses taken) into specific curriculum areas (mathematics, natural science, social science, English, the arts, and foreign language). As shown in Table 7, mathematics was the largest contributor to the prediction of ACT composite test scores, as indicated by the Beta weights. Natural science was the second largest predictor. The other curriculum areas did not contribute substantially.

The second sub-analysis examined what specific courses affected ACT scores. The specific courses in each curriculum area were entered into the multiple regression equation. As shown in Appendix A, the five courses that made the largest contribution to the prediction of ACT composite test scores, as indicated by the Beta weights, included Chemistry, Algebra II, Geometry, English 12, and French.

Table 7

Multiple Regression Analysis for the Relationship Between ACT Composite Scores and Number of Core Courses Taken in Specific Curriculum Areas

Dependent Variable--ACT Composite Test Scores

(N = 21,131)

Variables Entered	Beta Weights
1. Arts	.012
2. English	-.068
3. Foreign Language	.073
4. Social Studies	.039
5. Natural Science	.113
6. Mathematics	.231

Analysis of Variance

Multiple R .730 R^2 .533 F 1697.363

The third sub-analysis investigated the smallest set of variables that could each make a meaningful contribution to ACT scores. To do this, a Stepwise multiple regression analysis was performed on all of the variables--including specific academic courses. The Stepwise multiple regression identified the largest contributor to the prediction of ACT composite test scores. That specific variable was identified and entered first. The Stepwise

multiple regression analysis was then recomputed and the next largest contributor to the prediction of ACT composite test scores was identified and entered. A "small" effect size (.01) was also used in the analysis of data as the criterion for including a variable in the equation. Thus, in the Stepwise procedure, a variable was added to the equation only if it resulted in an increase in R of at least .1 or R^2 of .01. A conventional operational definition of a "small" effect size is R = .1 or R^2 = .01 (Cohen, 1977, p. 413). As shown in Table 8, this process continued as long as each new variable resulted in an R^2 increment of at least .01 ("small" effect size), which resulted in seven steps. The three largest predictors were grade point average, Algebra II, and gender.

According to the Stepwise multiple regression analysis the grade point average variable made the largest contribution to the predication of ACT composite test scores. The next six variables entered that met the criterion were: Algebra II, Gender, Class Rank, Chemistry, Geometry and Trigonometry.

To better describe the sample, every variable examined in this research study was broken down into specific categories. The average ACT composite test score and the number of students in each category is detailed in Appendix A.

Summary

The major problem in this study was to determine what variables relate to ACT scores of public high school students in the state of Iowa. Eight variables were researched to determine their effects

Table 8

Stepwise Multiple Regression Analysis for the Relationship Between ACT Composite Test Scores and All Variables Researched--Including Specific Academic Courses

Dependent Variable--ACT Composite Test Scores

(N = 21,131)

Step	Variable Entered	R^2	R^2 Increments
1	Grade Point Average	.378	-
2	Algebra II	.431	.053
3	Gender	.465	.034
4	Class Rank	.485	.020
5	Chemistry	.502	.017
6	Geometry	.515	.013
7	Trigonometry	.523	.008

upon ACT composite test scores. This study utilized the total population of Iowa public high school students taking the ACT examination during the 1986-1987 school year (N = 21,131).

Because of the large sample size in this study, even very "small" relationships would be statistically significant. Therefore, the results were interpreted in terms of effect size.

The research variables that had the greatest effect upon the prediction of ACT composite test scores were grade point average,

followed by class rank, sex, and the academic preparation of students. The other three variables--family income level, graduating class size, and school district cost per pupil--were of lesser effect.

Sub-analyses were performed upon the area of academic preparation. First, it was found that the courses displayed the greatest effect upon ACT composite test scores were Algebra II, Chemistry, Geometry, Trigonometry, and English 12. Students who had completed these courses tended to score higher on the ACT examination.

Second, the completion of courses in the areas of mathematics and natural science exerted a greater effect upon ACT composite test scores than did the completion of courses in the other areas of English and social science.

Third, it was found that the three greatest predictors of ACT composite test scores were grade point average, the completion of Algebra II, and gender. Discussion of the findings and recommendations for further research will be included in Chapter V.

CHAPTER V

DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

This study examined the relationship between ACT composite test scores of Iowa public high school students and school, student, and family variables. ACT test scores of 21,131 Iowa public high school students were collected and examined. Chapter V is arranged into 2 sections--the discussion and conclusion section, and the recommendation section.

Discussion and Conclusions

The major problem of this study was to determine what variables related to ACT composite test scores of public high school students in Iowa. One major independent variable, academic preparation, and seven other secondary independent variables were examined to determine their effect upon ACT composite test scores. The findings of this study are summarized below.

The concept of effect size was used to interpret the size of the correlation coefficients. The conventional definitions proposed by Cohen (1977) were used: "small" effect size, $r = .10$ and $r^2 = .01$; "medium" effect size, $r = .3$ and $r^2 = .09$; and "large" effect size, $r = .5$ and $r^2 = .25$.

Academic Preparation of Iowa Public High School Students

The analysis of data in this study supported the research hypothesis that there was a positive relationship between ACT composite test scores and academic preparation. The correlation demonstrated a "medium" effect size. The independent variable,

academic preparation, was statistically significant in predicting ACT composite test scores.

Maxey, Cargile, and Laing (1986) found that the number of core courses taken in the relevant academic area are important predictors of ACT test score performance. They also reported that in the areas of English and social studies the number of courses taken was a weaker predictor than in the mathematics and natural sciences area. Their findings were similar to the findings of this study.

Russo and Checketts (1978) examined the effect that academic preparation had upon ACT composite test scores. They found that "the relationship between number of academic courses taken by the student and composite ACT scores was in a positive direction" (p. 200). Further, twenty-five percent of the total variance on composite ACT scores was explained by the linear regression on ACT composite test scores by academic course taking. This "medium" effect size matched the "medium" effect size found in the analysis of data in this study.

Laing, Engen, and Maxey (1986) found the number of core academic courses taken contributed significantly to the prediction of ACT test scores. Hurst (1984) discovered the total number of academic units taken in high school contributed significantly to the variance in ACT composite test scores. Noble and McNabb (1989) found that "increased course taking, particularly in mathematics and natural science related to improved ACT test performance"

(p. 25). All three of these studies concurred with the findings of this paper.

In almost all cases, the more courses completed in mathematics, natural science, social science, and English related to higher ACT test scores. Because the ACT assessment tests these four specific academic areas, it could be said that students would be specifically taught for the ACT test by taking courses in these academic areas, and this would lead to probable higher ACT test scores.

Size of Iowa Public High School Graduating Class

This study showed a positive relationship between ACT composite test scores and the size of a student's high school graduating class. The analysis of data showed a "small" effect size between the variables. Thus, the data weakly supported the research hypothesis.

Reference Norms for 1987 ACT Tested High School Graduates (1987) reported on a national level that as graduating class size increased so did ACT composite test scores--up to the final category (600 students and above) which showed a slight decrease. The Iowa Department of Public Instruction (1986) analyzed the ACT data specifically for the state of Iowa. Their findings matched the national findings. They found an increase in ACT composite test scores as graduating class size increased--up to the final category--which showed a decline of .5. These findings were similar to the findings reported in this research study.

The slight positive relationship between ACT composite test scores and the size of a high school student's graduating class may be explained by several possible hypotheses. The larger a school district, the more often advanced academic courses are offered. This could help students achieve a higher ACT test score. In addition, older, more experienced teachers may be available to teach these advanced courses. These factors could account for the slight increase in ACT composite test scores according to graduating class size.

Iowa Public School District's Cost Per Pupil

The analysis of data did not support the research hypothesis in this variable category. A positive relationship between ACT composite test scores and a school district's cost per pupil could not be demonstrated. The r value was below the threshold of the "small" effect size.

This study showed this variable to have the least ability to predict ACT composite test scores. Two-thirds of Iowa's public school districts spend between $2,811.00 and $3,310.00 on their students. The relatively small difference ($499), coupled with the higher cost of maintaining smaller school districts is probably why this variable proved to be statistically less significant. Basically, a school district's board of education tries to equate its cost per pupil spending to most other school districts in the state and attempts to meet minimum state guidelines for educational programs. Because of this, the level of education in Iowa, for

the most part, seems to be relatively homogeneous among schools. This, then, is a partial explanation of this study's findings.

Ethnicity of Iowa Public High School Students

A relationship was found between ACT composite test scores and ethnicity of Iowa public high school students. In Iowa, ethnicity represented a "large" effect size regarding its effect upon ACT composite test scores.

Reference Norms for 1987 ACT Tested High School Graduates (1987) showed that five minority groups (Asian-American, Hispanic, American-Indian, Mexican-American and Afro-American) scored lower on the ACT assessment examination than non-minority students nationally.

McGeever (1983) reported that "black achievement levels were approximately one standard deviation below those of whites" (p. 22). The findings of this study agree with the ACT reference norms and McGeever.

According to this study's research, a significant difference in the scores of Iowa public high school students appeared among minority groups. Only five percent of Iowa's public high school students who took the ACT assessment examination were classified as members of a minority group. Therefore, because of this relatively small proportion of minority test takers, these comparisons must be made cautiously.

Ethnicity in the state of Iowa had a significant effect upon ACT test scores. Several factors for these test score differentials

can be discussed. Some groups, such as the NAACP, claim test bias causes these lower scores. Other factors may include a tendency toward larger families and a higher percentage of single parent families in minority groups. Their family income levels are lower and the minority enrollment in advanced academic courses is lower than for non-minority students. These factors and others may be probable causes for the ACT test score differences related to ethnicity found in this study.

Gender of Iowa Public High School Students

The gender of Iowa public high school students taking the ACT assessment examination was related to their ACT composite test score. The analysis of data showed that males scored higher than females on the ACT examination. A "medium" effect size was calculated.

Nationally, males outscored females on the ACT assessment examination (Reference Norms for 1987 ACT Tested High School Graduates, 1987). This trend was also true for students in Iowa (Reference Norms for 1987 ACT Tested High School Graduates, 1987). McGeever's research found that "men outperformed women in composite ACT test scores" (p. 23). Laing, Engen, and Maxey (1986), noted that males obtained higher ACT composite test scores than females. Munday (1976), showed that males had an ACT composite score 1.2 points higher than females. Ferguson and Maxey (1976) concurred with Munday's findings.

On a national level, males scored 1.3 points higher on the ACT assessment examination than females (Reference Norms for the 1987 ACT Tested High School Graduates, 1987). Since the standard deviation for composite ACT test scores is approximately 5.0, these differences are also in the "medium" effect size, consistent with the findings of this study.

One possible explanation for the ACT test differences between males and females is that the majority of students enrolled in advanced mathematic and natural science courses are males (Noble & McNabb, 1989). Thus, more males are being prepared for success on the ACT assessment examination than females.

Class Rank of Iowa Public High School Students

A positive relationship was determined between ACT composite test scores and a student's class rank. The analysis of data produced a "large" effect size that this variable had upon ACT composite test scores.

Maxey, Cargile, and Laing (1986) researched class rank and its effect upon ACT composite test scores on a national level. They found that class rank was a significant (p = .05) predictor for ACT composite test scores. Laing, Engen, and Maxey (1986) also reported a clear positive relationship between rank in class and ACT composite test scores.

Class rank followed the independent variable grade point average as the variable with the second largest effect size in this study.

This is logical since the class rank of a student is directly related to grade point average.

Grade Point Average of Iowa Public High School Students

A student's grade point average did have a positive relationship upon the ACT composite test score. The analysis of data showed this variable had a "large" effect size, in fact the largest of all variables examined. As the research hypothesis expected, students with the highest grade point averages were most likely to achieve the highest ACT test scores.

Noble and McNabb (1989) showed that grade point average for all high school coursework had a very significant effect upon ACT composite test scores. Maxey, Cargile, and Laing (1986) found high school grade point average was "an important predictor of ACT test score performance" (p. 6). Laing, Engen, and Maxey (1986), also found high school grade point average "contributed significantly" (p. 9) to predicting ACT test scores. Each of these findings matched those of this study.

Family Income Levels of Iowa Public High School Students

In this study, a family's income level had a "small" positive relationship upon ACT composite test scores. This finding was supported by the national data provided by the American College Testing program (Reference Norms for 1987 ACT Tested High School Graduates, 1987) which showed that on the national level, as a family's income increased so did their son's or daughter's ACT composite test score.

McGeever (1983) found a positive relationship between socio-economic status and standardized test scores. Since socio-economic status is related to family income levels and standardized test scores have been shown to be related to ACT test scores, it follows that the results of McGeever's study are consistent with the results of this study.

An explanation for this "small" positive relationship between ACT test scores and family income levels may be that families with more money are able to "purchase" more educational opportunities for their son or daughter. They can do this by: enrolling their children in special schools; hiring tutors for specific deficiencies; and by purchasing more and better educational materials.

To summarize, the following list indicates the statistical importance of each researched variable upon ACT composite test scores.

Large Effect Size

Grade Point Average

Class Rank

Ethnicity

Medium Effect Size

Academic Preparation

Gender

Small Effect Size

Family Income Level

Graduating Class Size

School District's Cost Per Pupil (less than a "small" effect size)

Recommendations

The following recommendations are for future researchers of ACT test scores.

1. Further investigation should be undertaken regarding the ACT scores of Iowa private and parochial high school students and school, student, and family variables.

2. Further study should be undertaken regarding the effect that a school district's cost per pupil has upon standardized test scores, including ACT test scores.

3. Further study should be undertaken regarding specific academic core courses and the effect those specific courses have upon standardized test scores, including ACT test scores.

4. Further study should be undertaken regarding the effect that various study skills have upon grades and standardized test scores, including ACT test scores.

5. Further study should be undertaken on the effect that various teaching strategies in the core curriculum areas have upon subsequent grades and standardized test scores, including ACT test scores.

6. Further investigation should be undertaken regarding the effect that a student's graduating class size has upon standardized test scores, including ACT test scores.

Based on the research findings of this study, the two factors that influenced ACT test scores the greatest were grade point average and a student's class rank. Both of these variables are inter-related and students can greatly influence their grade point average and class rank.

Three variables, ethnicity ("large" effect size), gender ("medium" effect size), and family income level ("small" effect size) are not under the student's control and thus, are hard to influence.

Academic preparation ("medium" effect size) is a variable that can alter students' achievement on the ACT assessment examination. A great deal of attention must be given to what courses students take and complete during their high school years. A rigid academic curriculum will probably lead to higher ACT test scores.

The last two categories, graduating class size ("small" effect size) and a school district's cost per pupil (less than a "small" effect size) had very little effect on ACT test scores.

More information is needed to ascertain the factors that will help students achieve general academic knowledge. Once factors can be pinpointed, then educators, parents, and students can use these factors to help future students improve their knowledge and

prepare them for success in taking the American College Testing program's assessment examination.

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APPENDIX A

Statistical Data

Table 9

Table 10

Table 11

Table 12

Table 13

Table 14

Table 15

Table 16

Table 17

Table 9

Iowa Public High School District Cost Per Pupil 1986-1987

High School District Within County	Gen Ed Exp Per Pupil A.D.M.
Adair	
Bridgewater-Fontanelle	3,022.79
Greenfield Community	3,100.46
Orient-Macksburg Community	3,212.64
Totals	3,109.94
Adams	
Corning Community School	3,138.46
Prescott Community	3,950.39
Totals	3,289.13
Allamakee	
Allamakee Community	3,242.28
Eastern Allamakee Community	3,566.63
Postville Community	3,128.61
Totals	3,280.29
Appanoose	
Centerville Community	3,089.19
Moravia Community School	2,953.55
Moulton-Udell Community	3,015.06
Totals	3,055.53
Audubon	
Audubon Community School	3,254.74
Exira Community School	3,283.44
Totals	3,263.47
Benton	
Belle Plaine Community	3,201.57
Benton Community School	3,264.77
Norway Community School	3,549.73
Shellsburg Community	3,201.83
Urbana Community School	3,170.50
Vinton Community School	2,911.88
Totals	3,146.19

(table continues)

High School District Within County	Gen Ed Exp Per Pupil A.D.M.
Black Hawk	
Cedar Falls Community	3,095.30
Dunkerton Community	3,522.29
Hudson Community School	3,806.63
La Porte City Community	3,369.83
Waterloo Community	3,463.62
Totals	3,377.02
Boone	
Boone Community School	2,967.80
Grand Community School	6,925.91
Madrid Community School	2,889.25
Ogden Community School	2,836.44
United Community School	3,467.94
Totals	3,055.18
Bremer	
Denver Community School	3,236.89
Janesville Consolidated	3,775.99
Plainfield Community	3,242.83
Sumner Community School	3,310.37
Tripoli Community School	3,067.76
Wapsie Valley Community	3,017.36
Waverly-Shell Rock	2,993.55
Totals	3,150.84
Buchanan	
East Buchanan Community	3,287.04
Independence Community	3,270.77
Jesup Community School	3,415.28
Totals	3,313.42
Buena Vista	
Albert City-Truesdale	3,367.99
Alta Community School	3,359.38
Newell-Providence	3,327.99
Sioux Rapids-Rembrandt	3,149.77
Storm Lake Community	2,881.12
Totals	3,094.47

(table continues)

High School District Within County	Gen Ed Exp Per Pupil A.D.M.
Butler	
Allison-Bristow Community	3,162.08
Aplington Community	3,261.13
Clarksville Community	3,143.98
Dumont Community School	3,687.02
Greene Community School	3,431.52
New Hartford Community	3,279.58
Parkersburg Community	3,251.35
Totals	3,290.46
Calhoun	
Cedar Valley Community	3,712.32
Lake City Community	3,134.25
Lohrville Community	3,735.51
Lytton Community School	3,567.14
Manson Community School	3,401.76
Pomeroy Community School	2,921.36
Rockwell City Community	3,441.58
Totals	3,355.74
Carroll	
Carroll Community School	3,299.38
Coon Rapids Community	3,120.23
Glidden-Ralston Community	3,019.02
Manning Community School	3,433.07
Totals	3,244.35
Cass	
Anita Community School	3,564.11
Atlantic Community	2,958.68
C and M Community School	2,257.75
Griswold Community	3,015.23
Totals	3,037.51
Cedar	
Bennett Community School	2,778.59
Clarence-Lowden Community	3,292.75
Durant Community School	3,323.35
Lincoln Community School	3,220.38
Tipton Community School	3,076.45
West Branch Community	3,095.42
Totals	3,144.49

(table continues)

High School District Within County	Gen Ed Exp Per Pupil A.D.M.
Cerro Gordo	
Clear Lake Community	2,935.71
Mason City Community	3,319.74
Meservey-Thornton	3,342.63
Rockwell-Swaledale Community	3,224.89
Ventura Community School	3,373.47
Totals	3,233.88
Cherokee	
Aurelia Community School	3,145.88
Cherokee Community	3,128.41
Marcus Community School	3,174.95
Meriden-Cleghorn	3,471.89
Willow Community School	3,415.34
Totals	3,195.75
Chickasaw	
Fredericksburg Community	3,292.36
Nashua Community School	3,505.33
New Hampton Community	2,975.47
Totals	3,149.92
Clarke	
Clarke Community School	3,014.25
Murray Community School	3,300.39
Totals	3,066.66
Clay	
Clay Central Community	3,566.80
Everly Community School	3,568.36
Sioux Valley Community	2,920.84
South Clay Community	3,599.41
Spencer Community School	2,998.33
Totals	3,136.89
Clayton	
Central Community School	2,924.77
Garnavillo Community	3,447.39
Guttenberg Community	3,826.79
Mar-Mac Community School	3,701.87
M-F-L Community School	2,983.88
Starmont Community	3,165.25
Totals	3,259.27

(table continues)

High School District Within County	Gen Ed Exp Per Pupil A.D.M.
Clinton	
Calamus Community School	3,479.65
Camanchi Community	3,227.21
Central Clinton Community	3,231.11
Clinton Community School	3,261.92
Delwood Community School	3,651.38
Lost Nation Community	3,549.15
Northeast Community	3,270.02
Wheatland Community	3,073.40
Totals	3,270.45
Crawford	
Ar-We-Va Community	3,450.01
Charter Oak-Ute Community	3,233.70
Denison Community School	2,900.67
Dow City-Arion Community	3,220.81
Manilla Community School	3,241.41
Schleswig Community	2,967.54
Totals	3,068.97
Dallas	
Adel-De Soto Community	3,064.34
Central Dallas Community	3,717.48
Dallas Center-Grimes	3,043.80
Dexfield Community	3,475.94
Perry Community School	3,243.63
Van Meter Community	3,269.29
Waukee Community School	2,878.93
Woodward-Granger Community	3,219.23
Totals	3,156.89
Davis	
Davis County Community	2,828.56
Totals	2,828.56
Decatur	
Central Decator Community	3,536.76
Lamont Community School	3,029.64
Mormon Trail Community	3,878.91
Totals	3,462.35

(table continues)

High School District Within County	Gen Ed Exp Per Pupil A.D.M.
Deleware	
Edgewood-Colesburg Community	3,103.73
Maquoketa Valley Community	3,450.45
West Delaware County	3,099.40
Totals	3,188.37
Des Moines	
Burlington Community	3,255.80
Danville Community	2,974.15
Mediapolis Community	2,805.56
West Burlington Ind	3,149.38
Totals	3,174.59
Dickinson	
Arnolds Park Cons	4,266.49
Harris-Lake Park Community	3,240.37
Milford Community School	2,906.50
Spirit Lake Community	2,986.15
Terril Community School	3,422.50
Totals	3,134.08
Dubuque	
Dubuque Community School	3,240.85
Western Dubuque Community	3,490.26
Totals	3,300.02
Emmet	
Armstrong-Ringsted Community	3,490.66
Estherville Community	3,265.71
Lincoln Central Community	3,163.31
Totals	3,306.28
Fayette	
North Fayette Community	3,390.34
Oelwein Community School	3,282.60
Turkey Valley Community	3,397.23
Valley Community School	3,111.45
West Central Community	3,317.86
Totals	3,311.78

(table continues)

High School District Within County	Gen Ed Exp Per Pupil A.D.M.
Floyd	
Charles City Community	3,613.99
Nora Springs-Rock Falls	3,327.24
Rudd-Rockford-Marble Rock	3,443.97
Totals	3,532.29
Franklin	
Cal Community School	3,934.94
Hampton Community School	3,022.31
Sheffield-Chapin Comm	3,473.67
Totals	3,254.73
Fremont	
Farragut Community	3,485.44
Fremont-Mills Community	2,943.96
Hamburg Community School	3,398.11
Sidney Community School	3,378.02
Totals	3,273.55
Greene	
East Greene Community	3,213.67
Jefferson Community	3,338.84
Paton-Churdan Community	3,661.75
Scranton Consolidated	3,442.33
Totals	3,372.15
Grundy	
Beaman-Conrad-Liscomb	3,120.40
Dike Community School	3,056.50
Grundy Center Community	3,301.86
Reinbeck Community	3,868.94
Wellsburg Community	3,430.24
Totals	3,320.82
Guthrie	
Adair-Casey Community	3,184.34
Bayard Community School	6,285.74
Guthrie Center Community	2,954.04
Panora-Linden Community	2,942.36
Siuari-Menlo Community	2,957.48
Yale-Jamaica-Bagley Comm	3,563.16
Totals	3,186.75

(table continues)

High School District Within County	Gen Ed Exp Per Pupil A.D.M.
Hamilton	
Northeast Hamilton	3,624.86
South Hamilton Community	3,026.31
Stratford Community	3,726.09
Webster City Community	3,299.73
Totals	3,298.40
Hancock	
Britt Community School	2,977.90
Cornwith-Wesley Community	4,787.98
Garner-Hayfield Community	2,847.88
Kanawha Community School	3,227.73
Klemme Community School	3,628.20
Woden-Crystal Lake Community	4,204.50
Totals	3,250.91
Hardin	
Ackley-Geneva Community	3,190.38
Alden Community School	2,861.27
Eldora-New Providence	3,038.02
Hubbard Community School	2,834.26
Iowa Falls Community	3,207.26
Radcliffe Community	3,567.30
Steamboat Rock Community	4,317.91
Union-Whitten Community	3,829.97
Totals	3,195.39
Harrison	
Dunlap Community School	3,083.30
Logan-Magnolia Community	3,278.74
Missouri Valley Community	3,022.51
West Harrison Community	3,586.02
Woodbine Community	2,951.60
Totals	3,151.82
Henry	
Mount Pleasant Community	2,892.19
New London Community	2,843.25
Waco Community School	3,057.19
Winfield-Mt Union	3,391.57
Totals	2,953.65

(table continues)

High School District Within County	Gen Ed Exp Per Pupil A.D.M.
Howard	
Howard-Winneshiek Community	3,274.38
Riceville Community	2,831.93
Totals	3,138.97
Humboldt	
Boone Valley Community	6,267.45
Gilmore City-Bradgale	4,106.27
Humboldt Community	3,129.39
Twin Rivers Community	4,186.95
Totals	3,603.29
Ida	
Battle Creek Community	3,317.92
Galva-Holstein Community	3,071.67
Ida Grove Community	2,759.22
Totals	2,986.93
Iowa	
Amana Community School	4,382.81
Deep River-Millersburg	3,203.69
English Valleys Community	3,290.11
H-L-V Community	3,448.96
Iowa Valley Community	3,088.13
Williamsburg Community	3,337.53
Totals	3,350.55
Jackson	
Andrew Community School	3,299.12
Bellevue Community	3,213.98
East Central Community	3,236.85
Maquoketa Community	3,158.38
Preston Community School	3,194.58
Totals	3,197.54
Jasper	
Baxter Community School	2,944.29
Colfax-Mingo Community	3,266.01
Lynnville-Sully Community	3,186.72
Monroe Community School	3,157.11
Newton Community School	2,942.66
Prairie City Community	2,850.09
Totals	3,019.95

(table continues)

High School District Within County	Gen Ed Exp Per Pupil A.D.M.
Jefferson	
Fairfield Community	3,267.72
Totals	3,267.72
Johnson	
Cedar Creek Community	3,504.00
Iowa City Community	3,063.93
Lone Tree Community	3,073.07
Solon Community School	3,154.09
Totals	3,098.38
Jones	
Anamosa Community School	3,226.36
Midland Community School	3,229.23
Monticello Community	3,170.34
Olin Consolidated School	3,317.09
Oxford Junction Consolidated	3,452.40
Totals	3,230.60
Keokuk	
Hedrick Community School	3,852.42
Keota Community School	3,141.54
Pekin Community School	3,030.92
Sigourney Community School	3,222.88
Tri-County Community	2,912.61
Totals	3,149.42
Kossuth	
Algona Community School	3,418.15
Burt Community School	3,888.83
Lakota Consolidated	5,527.21
LuVerne Community	4,740.57
North Kossuth Community	4,244.47
Sentral Community School	3,641.89
Titonka Consolidated	4,350.54
Totals	3,818.79

(table continues)

High School District Within County	Gen Ed Exp Per Pupil A.D.M.
Lee	
Central Lee Community	3,254.75
Fort Madison Community	3,146.42
Keokuk Community School	3,094.47
Totals	3,144.01
Linn	
Alburnett Community	3,034.39
Cedar Rapids Community	3,354.28
Center Point Consolidated	2,856.02
Central City Community	3,538.92
College Community School	3,192.29
Linn-Mar Community	3,025.41
Lisbon Community School	3,327.76
Marion Independent	3,496.89
Mount Vernon Community	2,929.76
North Linn Community	3,480.85
Springville Community	3,361.26
Totals	3,289.06
Louisa	
Columbus Community	3,270.29
Louisa-Muscatine Community	2,967.75
Morning Sun Community	3,434.44
Wapello Community School	3,139.38
Totals	3,138.37
Lucus	
Chariton Community	2,887.31
Russell Community School	3,057.36
Totals	2,913.05
Lyon	
Central Lyon Community	2,811.38
George Community School	3,060.12
Little Rock Community	2,913.76
West Lyon Community	2,986.55
Totals	2,928.95

(table continues)

High School District Within County	Gen Ed Exp Per Pupil A.D.M.
Madison	
Earlham Community School	3,098.34
Interstate 35 Community	3,021.90
Winterset Community	2,888.24
Totals	2,965.91
Mahaska	
Fremont Community School	3,256.00
North Mahaska Community	3,361.04
Oskaloosa Community	2,853.04
Totals	2,952.66
Marion	
Knoxville Community	2,915.70
Melcher-Dallas Community	2,928.93
Pella Community School	2,872.54
Pleasantville Community	3,164.86
Twin Cedars Community	3,100.90
Totals	2,955.41
Marshall	
Green Mountain Independent	2,888.11
L D F Community School	3,116.46
Marshalltown Community	3,411.44
Semco Community School	3,379.77
West Marshall Community	3,307.84
Totals	3,355.32
Mills	
Glenwood Community	2,844.42
Malvern Community School	3,352.25
Nishna Valley Community	3,674.52
Totals	3,054.29
Mitchell	
Osage Community School	3,260.38
St Ansgar Community	3,068.12
Totals	3,195.36

(table continues)

High School District Within County	Gen Ed Exp Per Pupil A.D.M.
Monona	
East Monona Community	3,294.59
Maple Valley Community	3,563.16
West Monona Community	3,192.48
Whiting Community School	3,499.60
Totals	3,373.64
Monroe	
Albia Community School	2,990.18
Totals	2,990.18
Montgomery	
Red Oak Community School	3,070.70
Stanton Community School	2,792.74
Villisca Community	3,064.06
Totals	3,028.94
Muscatine	
Muscatine Community	3,075.70
West Liberty Community	2,838.66
Wilton Community School	2,902.86
Totals	3,020.18
O'Brien	
Hartley-Melvin Community	3,148.80
Paullina Community	3,412.18
Primghar Community	3,104.64
Sanborn Community School	3,661.29
Sheldon Community School	2,830.99
Sutherland Community	3,517.43
Totals	3,135.86
Osceola	
Sibley-Ocheyedon Community	2,859.98
Totals	2,859.98
Page	
Clarinda Community	2,926.59
Essex Community School	2,921.63
Shenandoah Community	3,111.87
South Page Community	3,288.38
Totals	3,046.75

(table continues)

High School District Within County	Gen Ed Exp Per Pupil A.D.M.
Palo Alto	
Emmetsburg Community	3,352.66
Graettinger Community	3,128.40
Mallard Community School	3,710.66
Ruthven-Ayrshire Community	3,358.70
West Bend Community	4,029.59
Totals	3,445.08
Plymouth	
Akron Westfield Community	3,297.84
Hinton Community School	2,770.58
Kingsely-Pierson Community	3,088.09
Le Mars Community	2,857.06
Remsen-Union Community	4,168.95
Totals	3,052.41
Pocahontas	
Fonda Community School	4,063.07
Havelock-Plover Community	7,781.51
Laurens-Marathon Community	2,898.19
Palmer Consolidated	4,298.79
Pocahontas Community	3,675.87
Rolfe Community School	4,096.15
Totals	3,761.56
Polk	
Ankeny Community School	2,922.51
Bondurant-Farrar Community	3,108.41
Des Moines Independent	3,479.08
Johnston Community	3,013.48
North Polk Community	2,918.49
Saydel Consolidated	3,589.54
Southeast Polk Community	3,012.97
Urbandale Community	2,822.71
West Des Moines Community	2,995.73
Totals	3,284.80

(table continues)

High School District Within County	Gen Ed Exp Per Pupil A.D.M.
Pottawattamie	
Avoca Community School	3,279.79
Carson-Macedonia Community	2,958.81
Council Bluffs Community	3,245.01
Lewis Central Community	2,883.19
Oakland Community School	3,271.18
Treynor Community School	2,988.59
Tri-Center Community	2,990.66
Underwood Community	3,197.44
Walnut Community School	3,254.57
Totals	3,157.32
Poweshiek	
Brooklyn-Guernsey-Malcom	3,153.85
Grinnell-Newburg Community	3,114.69
Montezuma Community	3,144.75
Totals	3,128.98
Ringgold	
Diagonal Community	4,308.95
Grand Valley Community	4,076.51
Mount Ayr Community	3,230.98
Totals	3,529.36
Sac	
Crestland Community	3,677.38
Lake View-Auburn Community	3,440.50
Odebolt-Arthur Community	3,040.48
Sac Community School	3,149.35
Schaller Community	3,499.41
Wall Lake Community	3,366.34
Totals	3,297.23
Scott	
Bettendorf Community	3,354.73
Davenport Community	3,239.39
North Scott Community	3,349.18
Pleasant Valley Community	3,164.16
Totals	3,262.08

(table continues)

High School District Within County	Gen Ed Exp Per Pupil A.D.M.
Shelby	
Elk Horn-Kimballton	3,601.48
Harlan Community School	3,291.05
Irwin Community School	3,724.54
Shelby Community School	3,706.11
Totals	3,421.25
Sioux	
Boyden-Hull Community	2,942.36
Floyd Valley Community	3,384.84
Maurice-Orange City Community	3,004.81
Rock Valley Community	3,061.84
Sioux Center Community	3,125.40
West Sioux Community	3,405.25
Totals	3,142.99
Story	
Ames Community School	3,526.19
Ballard Community School	2,862.94
Collins-Maxwell Community	3,160.76
Colo Community School	3,278.51
Gilbert Community School	2,902.57
Nesco Community School	3,758.34
Nevada Community School	2,932.38
Roland-Story Community	2,985.69
Totals	3,250.13
Tama	
Dysart-Geneseo Community	3,625.69
Garwin Community School	3,192.94
Gladbrook Community	2,964.28
North Tama County Community	3,421.77
South Tama County Community	3,315.05
Totals	3,329.18
Taylor	
Bedford Community School	3,467.07
Clearfield Community	4,376.56
Lenox Community School	3,138.78
New Market Community	3,319.89
Totals	3,402.36

(table continues)

High School District Within County	Gen Ed Exp Per Pupil A.D.M.
Union	
Creston Community School	3,005.38
East Union Community	2,949.53
Totals	2,989.87
Van Buren	
Fox Valley Community	3,396.71
Harmony Community School	3,188.30
Van Buren Community	3,402.84
Totals	3,324.43
Wapello	
Blakesburg Community	3,258.33
Cardinal Community	3,145.91
Eddyville Community	3,407.21
Ottumwa Community School	3,169.05
Totals	3,191.52
Warren	
Carlisle Community	2,934.99
Indianola Community	2,908.56
Martendale-St Marys	2,976.36
Norwalk Community School	3,075.46
Southeast Warren Community	3,023.85
Totals	2,968.28
Washington	
Highland Community	3,132.50
Mid-Prairie Community	2,971.71
Washington Community	3,071.44
Totals	3,046.03
Wayne	
Lineville-Clio Community	4,026.53
Seymour Community School	2,916.14
Wayne Community School	2,926.04
Totals	3,011.60

(table continues)

High School District Within County	Gen Ed Exp Per Pupil A.D.M.
Webster	
Central Wesbter Community	3,637.63
Dayton Community School	3,781.27
Fort Dodge Community	3,439.12
Northwest Webster Community	3,811.93
Prairie Community School	3,290.16
Totals	3,462.54
Winnebago	
Buffalo Center-Rake	3,971.79
Forest City Community	3,004.21
Lake Mills Community	3,070.72
Thompson Community	4,565.45
Totals	3,277.12
Winneshiek	
Decorah Community School	3,134.69
North Winneshiek Community	3,727.60
South Winneshiek Community	3,513.57
Totals	3,313.25
Woodbury	
Anthon-Oto Community	3,110.15
Pastwood Community	3,147.31
Lawton-Bronson Community	2,932.41
Sargeant Bluff-Luton	2,868.57
Sioux City Community	3,042.44
Westwood Community	3,262.90
Woodbury Central Community	2,933.07
Totals	3,037.47
Worth	
North Central Community	3,162.19
Northwood-Kensett Community	3,246.41
Totals	3,203.38
Wright	
Belmond Community	3,161.36
Clarion Community School	3,331.34
Dows Community School	3,823.00
Eagle Grove Community	3,514.66
Goldfield Community	3,515.22
Totals	3,403.85
Grand State Totals	3,213.46

Table 10

Multiple Regression Analysis for the Relationship Between ACT Composite Test Scores and Specific Academic Courses Taken

Dependent Variable--ACT Composite Test Scores

(N = 21,131)

Variable Entered	Beta Weights
1. Algebra I	.021
2. Algebra II	.103
3. American Government	-.022
4. Art	-.007
5. Beginning Calculus	.007
6. Biology	.014
7. Chemistry	.117
8. Computers	.041
9. Drama	.011
10. Economics	-.008
11. English 9	.002
12. English 10	-.007
13. English 11	-.007
14. English 12	-.077
15. French	.074
16. General Science	-.004
17. Geography	-.008
18. Geometry	.098

(table continues)

Dependent Variable--ACT Composite Test Scores

(N = 21,131)

Variable Entered	Beta Weights
19. German	.065
20. Music	.030
21. Other Advanced Mathematics	.037
22. Other History	-.006
23. Other Language	.005
24. Physics	.060
25. Psychology	.008
26. Speech	-.002
27. Spanish	.046
28. Trigonometry	.068
29. U. S. History	.014
30. World History	.001

Analysis of Variance

Multiple R = .741	DF = 37
R^2 = .549	F = 423.319

Table 11

Frequencies of Cost Per Pupil and Mean ACT Scores

	ACT COMPOSITE	
Cost Per Pupil	Mean	Count
2750-2849	19.75	707
2850-2949	20.43	2380
2950-3049	20.47	3067
3050-3149	20.83	2966
3150-3249	20.04	3515
3250-3349	20.12	2495
3350-3449	20.47	2377
3450-3549	19.94	2518
3550-3649	20.39	426
3650-3749	19.46	216
3750-3849	20.53	121
3850-3949	18.82	83
3950-4049	21.60	60
4050-4149	18.76	50
Over 4150	18.01	150

Table 12

Frequencies of Grade Point Average and Mean ACT Scores

Grade Point	ACT COMPOSITE Mean	Count
1. .5 - .9	18.29	17
2. 1.0 - 1.4	14.16	171
3. 1.5 - 1.9	14.81	1165
4. 2.0 - 2.4	16.56	4066
5. 2.5 - 2.9	18.97	4937
6. 3.0 - 3.4	21.59	6171
7. 3.5 - 4.0	25.45	4154

Table 13

Frequencies of Class Rank and Mean ACT Scores

Class Rank	ACT COMPOSITE Mean	Count
1. Top 1/4	23.55	9144
2. 2nd 1/4	18.77	7847
3. 3rd 1/4	15.70	3311
4. 4th 1/4	14.20	341

Table 14

Frequencies of Class Size and Mean ACT Scores

Class Size	ACT COMPOSITE Mean	Count
1. 0 - 25	19.09	1266
2. 25 - 99	19.97	7004
3. 100 - 299	20.20	4198
4. 200 - 399	20.83	5284
5. 400 - 599	20.95	2528
6. 600 - 899	19.65	287
7. 900 - more	19.42	159

Table 15

Ethnicity Frequencies and Mean ACT Scores

Ethnic	ACT COMPOSITE Mean	Count
1. Black	15.04	280
2. Indian	16.57	77
3. White	20.48	19427
4. Mexican	18.18	109
5. Asian	19.40	214
6. Puerto Rican	17.54	28
7. Other	18.11	279
8. No Response	18.52	318

Table 16

Frequencies of Family Income Levels and Mean ACT Scores

Income	ACT COMPOSITE Mean	Count
0. Less than $6,000	19.13	1180
1. $6,000 - $11,999	19.06	1698
2. $12,000 - $17,999	19.70	2450
3. $18,000 - $23,999	19.90	2977
4. $24,000 - $29,999	20.31	2998
5. $30,000 - $35,999	20.41	2774
6. $36,000 - $41,999	20.83	1886
7. $42,000 - $49,999	21.45	1502
8. $50,000 - $59,999	21.47	987
9. $60,000 +	22.11	1293

Table 17

Frequencies of Academic Courses Taken and Mean ACT Scores

Courses	ACT COMPOSITE Mean	Count
Course 1 - English 9		
0	20.56	36
1	20.33	20641
Course 2 - English 10		
0	20.08	75
1	20.33	20600
Course 3 - English 11		
0	20.60	756
1	20.33	19803
Course 4 - English 12		
0	20.80	14796
1	19.26	5142
Course 5 - Speech		
0	20.45	8246
1	20.34	11252
Course 6 - Algebra I		
0	13.89	650
1	20.56	19963
Course 7 - Algebra II		
0	16.20	4991
1	21.80	15307
Course 8 - Geometry		
0	15.19	3007
1	21.30	17431
Course 9 - Trigonometry		
0	19.36	14399
1	23.49	4937
Course 10 - Calculus		
0	20.26	18432
1	24.64	407

(table continues)

Courses	ACT COMPOSITE Mean	Count
Course 11 - Advanced Math		
0	19.89	16163
1	23.19	3020
Course 12 - Computer Programming		
0	19.80	12756
1	21.51	6683
Course 13 - General Science		
0	21.18	2030
1	20.24	18358
Course 14 - Biology		
0	18.48	1261
1	20.48	19310
Course 15 - Chemistry		
0	18.07	8318
1	22.15	11702
Course 16 - Physics		
0	19.99	16356
1	22.96	3135
Course 17 - U. S. History		
0	19.12	243
1	20.35	20418
Course 18 - World History		
0	20.57	6511
1	20.25	13458
Course 19 - Other History		
0	20.36	14719
1	20.50	3829
Course 20 - American Government		
0	20.82	10720
1	19.80	9718
Course 21 - Economics		
0	20.61	13764
1	19.87	5808

(table continues)

Courses	ACT COMPOSITE Mean	Count
Course 22 - Geography		
0	20.53	14494
1	19.91	4410
Course 23 - Psychology		
0	20.56	14654
1	19.83	4753
Course 24 - Spanish		
0	20.01	10690
1	20.71	8931
Course 25 - French		
0	20.10	15013
1	21.36	4104
Course 26 - German		
0	20.19	16960
1	21.85	1879
Course 27 - Other Language		
0	20.32	18236
1	21.97	380
Course 28 - Art		
0	20.82	13232
1	19.24	6222
Course 29 - Music		
0	20.08	8572
1	20.57	11257
Course 30 - Drama		
0	20.43	17165
1	19.83	1686