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A COMPARISON OF GRADES EARNED IN
" AUTO MECHANICS I TO SELECTED
AVAILABLE CRITERIA

A Thesis

by

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June 1983

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TO SELECTED AVAILABLE CRITERIA

A THESIS
by
JEAN P. REID

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Abstract

The purpose of this study was to calculate the correlation between the first semester Auto Mechanics I grades of thirty-eight Alexander Central High School students and some criteria which are generally readily available in most secondary schools.

The criteria selected for the study were an aptitude for mechanical reasoning as presented by the Mechanical Reasoning subtest of the Differential Aptitude Test, Form V; a self-expressed career interest level as presented by a career interest survey, and a grade-equivalent reading level as presented by the California Achievement Test, Level 18. The Pearson product-moment formula was used to calculate the correlations between each variable and the first semester Auto Mechanics I grades. The .05 level was selected for determining significance.

The correlation between first semester Auto Mechanics I grades and aptitudes as presented by the DAT Mechanical Reasoning subtests was found to be significant at the .01 level. A conclusion of this study was that aptitudes should be considered as students attempt to select vocational courses of study, such as Auto Mechanics.

The correlation between first semester Auto Mechanics I grades and self-expressed career interest levels was found to be significant at the .01 level. A second conclusion of the study

was that self-expressed career interests should be considered as students attempt to select vocational courses of study, such as Auto Mechanics.

No statistically significant relationship was noted between the CAT reading levels and Auto Mechanics I first semester grades.

The primary implication of this study was that perhaps the best career guidance methods involve helping students to know as much about themselves, their capabilities, their interest, and their motivations as possible, and to be as knowledgeable as possible about all facets of careers and preparatory curricula.

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CHAPTER ONE

Introduction

In the recession-gripped 1980's many high school students are justifiably concerned with developing entry-level employment skills by the time they graduate from high school. Vocational training courses, such as auto mechanics, which provide entry-level skills, are particularly popular with these students. This popularity intensifies a common problem in education, that of how to help students select their best course of study while taking into consideration class size limitations.

In order for students to be well prepared for careers, they, along with teachers, counselors and administrators must consider a number of factors. It is not enough for a student to have an interest in developing a particular skill; he or she must also have the capability, the motivation and the opportunity to develop that skill.

Program costs, budget cuts and personnel shortages have made it necessary to limit class enrollments in various subjects, thus denying access to some students. It is admittedly unfair to deny a highly capable student access to a class because of limited space, and equally unfair to enroll a student who is incapable of success in that class. Yet each of these situations is likely to occur when a predetermined number of students is selected at

random from all those requesting a popular course or when selection is based upon some inappropriate criteria.

The desire for entry-level employment skills, coupled with the early adolescent's fascination with the automobile, has increased the popularity of Auto Mechanics I to the point that not all students who request the course can be adequately served. The 1982 Program of Studies of the Vocational Division of the North Carolina Department of Education recommends an Auto Mechanics I class enrollment of 12 to 16 students.

Statement of Problem

The purpose of this study is to calculate the correlation between selected available criteria in secondary schools and grades earned in Auto Mechanics I classes. Specifically the study attempts to answer the following questions:

1. To what extent do scores on the Mechanical Reasoning subtest of the Differential Aptitude Test correlate with first semester grades earned in Auto Mechanics I?
2. To what extent do self-expressed career interest levels correlate with first semester grades earned in Auto Mechanics I?
3. To what extent do California Achievement Test grade-equivalent reading level scores correlate with first semester grades earned in Auto Mechanics I?

Significance of Study

With more students requesting Auto Mechanics I than can be adequately served, students, teachers, counselors and administrators are faced with difficult choices. If students are randomly selected for classes or selected on the basis of inappropriate criteria, the best suited students may be turned away while unqualified students, who are unlikely to succeed in the classes, may be accepted.

This presents a twofold problem; first it is unfair both to qualified students who are denied enrollment in the classes and to unqualified students who are unlikely to succeed in the classes. Secondly, it creates the problem for schools that if fewer qualified students are selected for Auto Mechanics I classes then fewer entry-level skilled individuals can be expected to emerge from the current three year program.

The review of literature shows a need to study a number of factors when attempting to predict students' chances for success in any area. Some of the studies suggest that specific instruments be developed to predict success in vocational courses. However, secondary schools do not need to be burdened with more tests if some of the already available data can be used to determine to some extent students' chances of success in classes. A logical assumption is that students who have an aptitude for, and an interest in, a particular course of study are more likely to be successful in that study than students who lack such aptitude and interest. It is also logical to assume that if reading material

is required in a course of study, then reading level is also a relevant factor.

Supporting the use of specific aptitude tests along with other criteria for guidance and planning for course work are these authors cited in the review of literature: French, 1964; Ghiselli, 1957, 1966; Kaltsounis, 1968; Littleton, 1952; Lokan, 1977; Novak, 1941; Patten, 1981; and Potter, 1953.

John Holland (1975:421) observes "it is possible that some types (of people) make better vocational decisions than others because they perceive themselves and the world more accurately." It follows, then, that the best career assistance for students may be to help them understand themselves, their capabilities, their interests, and their motivations as well as possible, and to help them gain knowledge about all facets of careers and preparatory curricula. It is the belief of this investigator that noting the relationship between available criteria and classroom grades is a step toward developing counseling tools to provide students with some of that assistance.

Hypotheses

The hypotheses to be tested in this study stated in null form are:

1. There is no correlation at the .05 level of confidence between the scores obtained by students on the Mechanical Reasoning subtest of the Differential Aptitude Test and first semester grades in Auto Mechanics I.

2. There is no correlation at the .05 level of confidence between students' self-expressed career interest levels and first semester grades in Auto Mechanics I.
3. There is no correlation at the .05 level of confidence between the grade-equivalent reading level scores obtained by students on the California Achievement Test and first semester grades in Auto Mechanics I.

Definitions

Certain terms used in this study are operationally defined as follows:

Auto Mechanics I

Auto Mechanics I is a tenth grade course of study which familiarizes the student with employment opportunities; necessary skills; trade terminology; tools, equipment and materials; and principles and theories relevant to auto mechanics. Approximately seventy-five percent of class time is spent using textbooks and other materials to gain technical and generally related information. The remainder of class time is spent working with engine displays and mock brake, fuel and other automotive systems.

Aptitude

Aptitude is a set of non-static characteristics which enable an individual to acquire, with training, certain skills, knowledge or abilities.

Mechanical Reasoning

Mechanical reasoning is an aptitude measure of how well an individual understands certain mechanical principles governing machinery, tools and motion as presented by the Mechanical Reasoning subtest of the Differential Aptitude Test.

Self-Expressed Career Interest

A self-expressed career interest is a choice of a career that most nearly represents the type of work one would like to do upon completion of high school.

Inventoried Interest

An inventoried interest is a measure of interest based upon questions which note how one's likes and dislikes resemble those of persons engaged in different occupations.

Assumptions and Limitations of the Study

It is the assumption of this investigator that among the factors influencing one's success in a class are aptitude, interest and reading ability, and that to some extent these factors can be measured and compared to that success.

This study is limited to the thirty-eight tenth grade boys at Alexander Central High School who are enrolled in Auto Mechanics I classes. No selection process was used in enrolling these students. Some students voluntarily dropped the Auto Mechanics I course when it conflicted head-on with another course which they requested at pre-registration. This may have eliminated some students who were not highly interested in auto mechanics. All of the

students finally enrolled in the class indicated some interest in an auto mechanics career or a related career, such as diesel mechanics or auto body repair.

It is not the contention of this study to suggest that the factors noted herein are the only factors influencing a high school student's eventual success or failure in a course of study. Many other factors affect one's success, possibly more strongly and more directly, than do aptitude, interest or reading level. These factors were selected for this study because they are generally readily available in most schools or they can be obtained fairly easily if not already available.

This study attempts only to calculate the correlation between certain selected criteria and grades earned in Auto Mechanics I classes without suggesting a relationship between the criteria and success or failure in an auto mechanics career.

CHAPTER TWO

Review of Related Literature

This review of literature dealing with aptitudes, interests and reading levels as they relate to vocational education is limited primarily to those studies involving high school students. Some studies involving other students are cited when they appear to have significance to high school students as well. No military studies are included.

Literature in three fields is relevant to this study: (1) literature dealing with aptitudes for vocational education; (2) literature dealing with vocational interests; and (3) literature relating reading ability to vocational education. The relationship of these factors to vocational study is the particular point of emphasis in this study.

Research in the area of vocational education has been concerned for the most part with the young adult rather than the adolescent. Material attempting to note a relationship between specific high school vocational studies, such as auto mechanics, and individual factors such as aptitudes, interests and reading levels is sparse.

The use of available criteria to predict vocational success in secondary schools was investigated by Edwin L. Herr and Stanley B. Baker (1973) as well as by William R. Grieve (1970). Both studies

concluded that a specific instrument would predict success more accurately than available criteria. Research of the literature, however, indicates that it is unlikely that an instrument can be so all-inclusive as to measure every factor, human and environmental, which influences one's success in a class or a career.

Aptitude

An assumption of this study is that an aptitude for mechanical reasoning is important to the study of auto mechanics. Much has been written about aptitude as it relates to success in a given career and even as it relates to post-secondary vocational study, but little about its relationship to high school study.

Anne Anastasi (1976:382) notes that "With regard to vocational criteria, there is some evidence for the predictive validity of individual DAT subtests, but the data are relatively meager."

No study was found which gives proven, unqualified support to the use of aptitude tests alone to predict success in vocational education. The most optimistic findings support the idea that aptitude is only one of many factors which influence one's success in a course of study or on a job.

An unpublished study conducted by the Prosser Vocational Center of Albany, Indiana, is cited by the Differential Aptitude Test publisher in DAT sales materials. This post-secondary school uses the Mechanical Reasoning subtest of the Differential Aptitude Test as a part of its admissions criteria for auto mechanics students. Prosser staff member Mark Kersey conducted the study on forms L and M of the DAT. Kersey noted in a telephone conversation

with this investigator that the results of the study are no longer available. He recalled that the study gave a high correlation between students' test scores and their success in the school's auto mechanics program. He also suggested that he would expect there to be some positive correlation between scores on the test and grades earned in an auto mechanics class at the secondary level.

E. L. Tolbert's (1974:86) analysis that "specific vocational aptitudes, such as mechanical or clerical, have less predictive efficiency for training or occupations (than academic aptitude has for level of education or occupation reached), but are useful in guidance and planning" is a recurring theme in the literature reviewed. This does not indict aptitude tests as fraudulent in any way, but it does give notice for the cautious use of such test results.

John Wick and Donald Beggs (1981:27) note that aptitude tests are frequently misused as a result of these misconceptions:

1. Aptitude is fixed and unchangeable.
2. One can predict just about anything with aptitude scores on an equal basis.
3. Once a child receives a score, there isn't much that can be done about it thereafter.

Were these not misconceptions, much of that which is problematic to predicting success on the basis of aptitude would be non-existent. However, humans are not static beings; there is change, evaluating and reevaluating, learning and relearning.

Experience itself is important to aptitude because it appears impossible to fully determine the direction of a cause and effect relationship between aptitude and performance of a skill. Isaac T. Littleton (1952:19) confirms "that mechanical knowledge is an

extremely important component in mechanical aptitude." Wick and Beggs (1981) on the other hand, contend that performance of a skill also enhances one's aptitude for that skill. Then with the likelihood that aptitude can and probably will change, another caution is advised. It should not be assumed solely on the basis of an aptitude test score that a student cannot gain sufficient aptitude to succeed in a class; experience may provide adequate aptitude for success.

The Differential Aptitude Test Student Pamphlet (1982:7), which provides scores to students, reminds students that they themselves may change and further states:

Aptitude tests will not pinpoint for you exactly what your career should be. These tests, by themselves, do not provide answers to such specific questions as: Can I be a plumber? But if you and your counselor will study your DAT scores along with other information you can get answers to such questions as: . . . Which would be the better job for me - mechanic or office worker?

In the Administrator's Handbook for the DAT (1982:14) the test's primary use is cited as that of a counseling tool. It does, however, refer to administrative use in the following manner:

In schools with special programs, there is often a need to select from the many students who may be interested in a particular program. A limited number of places in a given class make it desirable to have a satisfactory measure to identify the students who are most likely to benefit from the programs. Tests such as the DAT can be of use in selecting the most promising students from among the applicants.

A 1954 study conducted by J. E. Doppelt, Harold G. Seashore and J. G. Odgers provided an attempt to measure to what extent the DAT is useful in predicting the success of students in vocational curricula. One must realize, however, that vocational curricula

have changed dramatically in the years since the study was conducted. The method utilized is still of import and the findings are useful, if tempered by one's knowledge of the passage of time.

Doppelt, Seashore and Odgers set out to compare auto mechanics and machine shop grades and ratings on certain traits to DAT scores, but since seven different schools were included in the survey it was decided that grades would vary too much to be reliable. The ratings were assigned by the instructors on Understanding of Trade Information, Job Know-How, Quality of Work and Quantity of Work. Ratings were taken in the middle of the first year and at the end of the second year of a two-year course. The final ratings were assigned to eighty-eight auto mechanics students. The total ratings, combining the four traits, showed a .30 triserial coefficient of correlation with the Mechanical Reasoning subtest of the DAT.

The authors note that the low correlation in their study between mechanical reasoning and success in the auto mechanics course can to some extent be explained in that "a general interest in 'hot rods' or 'jalopies' may encourage some boys to enroll in Auto Mechanics without a sincere vocational objective and concurrent motivation" (1954:654).

The National Aptitude Survey is a test battery including Nonverbal Reasoning, General Vocabulary, Automotive Vocabulary, Chart Plotting Test, Game Playing Test, Survey of Object Visualization and a Biographical Information Blank. In his final report on the battery George L. Kaltsounis (1968:48) concluded that it is an effective means of estimating a "ninth or tenth grade boy's

chances of becoming an automobile repairman within three years after his expected graduation."

Edwin E. Ghiselli and Clarence W. Brown (1951:24) in researching a number of unpublished reports at various educational levels found that "intelligence, arithmetic, spatial relationships, and mechanical principles tests give the best predictors of success in training courses concerned with automotive mechanics."

Richard P. Foote's 1960 doctoral dissertation indicates that DAT Mechanical Reasoning scores are predictive of graduation from an automotive curriculum. It does not necessarily follow that graduation from the curriculum means that one must have attained grades commensurate with aptitudes, but it is obvious that passing grades were necessary for students to graduate from the curriculum.

In his 1954 doctoral dissertation Robert C. Hall administered the DAT to 287 boys prior to their graduation from high school then followed them up two years later. He found that the jobs students obtained were closely related to their aptitudes as measured by the DAT.

In summary, most researchers in this portion of the review of literature conclude that aptitude tests alone are ineffective predictors of success for auto mechanics students. Most do infer or state outright that aptitude tests are useful in guidance and planning (French, 1964; Ghiselli, 1966; Lokan, 1977; Potter, 1953; Prediger, 1968; and Tolbert, 1974). D. J. Prediger, C. C. Waple and G. R. Nusbaum (1968:144) make the interesting observation that "One cannot be sure how well a predictor will work in his own situation until he tries it out."

The studies further indicate that specific aptitude tests are most useful for guidance and planning when used in combination with other factors such as interests, academic motivation and capabilities, teacher recommendations and parental support (French, 1964; Ghiselli, 1957, 1966; Littleton, 1952; Kaltsounis, 1968; Lokan, 1977; Novak, 1941; Patten, 1981; and Potter, 1953).

Further, and more specifically, Super (1957:212) states that "Mechanical Comprehension is a useful concept, operationally, but it is actually a composite 'aptitude' rather than a unitary psychological factor. It consists of varying combinations of spatial visualization, perceptual speed (spatial), reasoning and mechanical information or reasoning." Test batteries such as the National Aptitude Survey measure aptitudes for vocabulary and non-verbal reasoning, and utilize biographical information when attempting to provide assistance to persons seeking the most suitable vocational courses of study.

It follows then, that an aptitude for mechanical reasoning is helpful, but it cannot be heralded as the only, or even the universally most useful, factor influencing ones ultimate success or failure in an auto mechanics course.

Interests

The review of literature indicates that interest is, with certain limitations, a time-proven factor in successful pursuit of a career, but little support was found for using interest to predict success in a specific course of study.

The developer of the Strong Vocational Interest Blank, E. K. Strong, Jr. (1943:18) indicates that interest is by no means a perfect predictor of success explaining that (1) "success" is personally defined by each individual, (2) a person may have an interest upon which he or she does not act, and (3) interests may be pursued through hobbies or other non-career related activities. Strong does note that interest is useful in counseling individuals toward a career, but he cautions that it should be used in conjunction with other data.

In recent years self-expressed career interest has gained some support as a useful counseling tool. The prevailing idea for many years has been that expressed interests have little validity, and that in order to find an individual's true interest an inventoried interest survey should be used. Commonly when inventoried and expressed interests did not agree it was assumed the expressed interests were invalid. Sonia Becker (1977) in studying such discrepancies suggests that expressed and inventoried interests probably do not agree because of the norms upon which they are based. Inventoried interests are based upon group norms while expressed interests are based upon individual norms.

As individuals learn more about themselves and about career possibilities, self-expressed career interests become more valid and, subsequently, more useful. With emphasis now in junior high schools on teaching students about careers and career preparations, students can be expected to better understand and express their true career interests.

In addition to debating the value of self-expressed versus inventoried interests the literature focuses more upon successful pursuit of careers than upon success in specific courses of study.

Among those authors most strongly favoring inventoried interests over expressed interests is Donald Super (1957:22) who concluded in an interesting study that in most cases expressed interests have a lower relationship to occupations entered than do inventoried interests. However, he did find that with "upperclass students" expressed interests were more likely to be followed through on than were inventoried interests.

Charles McArthur (1954) noted similar results in his study of the Strong Vocational Interest Blank. His study showed that the SVIB was not as accurate in predicting future occupations of college-preparatory school students as it was in predicting future occupations for public school students. His convincing explanation is that prep school students generally come from families for whom careers in such prestigious fields as law or medicine are expected regardless of inventoried interest reports.

It may also be surmized that in the years since the Super and McArthur studies a number of influential factors have arisen to lessen the gap between so-called upperclass students and their peers. Most students now have access to career information which may only previously have been available to, and used extensively by, prep school or college-bound students. Financial assistance through scholarships and loans makes it possible for students to pursue careers which may have been out of their reach in earlier years. Technical schools and college transfer programs also make

reaching career goals much easier for students who previously would not have had such educational opportunities. These factors would allow more students to pursue choice careers by eliminating some lack of information or financial barriers.

E. L. Tolbert (1974) noted that inventoried interests tend to be more stable than expressed interests. This seems to be a valid observation, but the stability found in an inventoried interest would not necessarily make it any more accurate in predicting success in a career or a course of study.

Patricia W. Lunneborg (1975), as well as Herbert C. Bartling and Albert B. Hood (1981), stresses that persons who are hopelessly undecided about careers have much difficulty expressing their interests. In such cases perhaps an interest inventory is the only viable method to determine interest.

Strong support for the usefulness of self-expressed interests is given by Robert H. Dolliver in his 1969 study "Vocational Interest Blank Versus Expressed Vocational Interests: A Review." He found that the Strong Vocational Interest Blank was not as accurate as expressed interest in predicting occupation in all studies reviewed which made a direct comparison. Later Dolliver and Julie A. Wills (1977) concluded that expressed interests are more accurate by a small amount, than inventoried interests are in predicting jobs after ten years.

The most extensive review of self-reports found by this investigator was conducted by Leonard Baird in 1976. His conclusion, based on several studies, is that simple expressed interest is the most useful type of expressed interest, more so than

biographical questionnaires or other substitutes for inventoried interests. He also notes that expressed interests predict at least as well as inventoried interests, but he acknowledges that expressed interests are not as reliable as inventoried interests.

Robert B. and Fiona M. Slaney (1981) in "A Comparison of Measures of Expressed and Inventoried Vocational Interest Among Counseling Center Clients" used a Vocational Card Sort, a type of expressed interest survey based upon previous work experience, and the Strong-Campbell Interest Inventory. They, too, found expressed interests to be as valid as inventoried interests and went on to suggest that expressed interests should be one of the counselor's tools.

Project TALENT which used a five percent sample of all American high schools, N = 400,000+, found that stated career plans were as accurate or more accurate than the TALENT Interest Inventory in predicting future careers (Whitney, 1966). W. W. Cooley (1967) found similar results in another longitudinal study comparing expressed interests with the Kuder (1956) and Strong (1951).

In summary it seems that for the student who is fairly knowledgeable about types of jobs, requirements for those jobs, and who is realistically aware of his or her own talents and limitations a self-expressed career interest can be very useful. Certainly in those cases where self-expressed interest is as valid as inventoried interest it should be used because it takes less time and effort for students, teachers and counselors. The major drawback for the use of expressed interests as a part of the predictive

process for success is that many adolescents are uncertain of their interests.

D. R. Whitney (1969:283) states that "expressed choice is not a single, simple dimension of a person's interests, but the result of a complex interaction of background and personal characteristics over a long period of time." This gives credence to the idea that the better informed student can make a more valid self-report. As noted with aptitude, interest should be one of many factors considered when one makes a choice concerning a career or a course of study.

Reading

Very little literature is available noting a direct relationship between reading and vocational education on any level. Nonetheless, there seems to be universal acknowledgement in education circles that reading ability is important in vocational education. This can be seen especially with such mandates as the Basic Skills Act (Title II) of the Educational Amendments of 1978 and the North Carolina Competency Test, both of which stress basic reading skills for all students. Auto mechanics students must attain the same minimum skill levels on the Competency Test as college-preparatory students.

Automobiles have become so complex in recent years that the mechanic's manual is one of the most frequently used tools of the trade. A good mechanic must be able to read and understand the technical language of the manual. Study using the textbook and related material comprises about seventy-five percent of the

instructional time in Auto Mechanics I while the remainder of instructional time is spent working on various automobile engine and systems displays.

In 1978 Eugene G. Sherrill attempted to identify the level at which a student must be able to read in order to successfully complete a pre-employment vocational education program for occupational entry. Auto Mechanics was one of the programs studied.

A total of thirty-four Auto Mechanics students were included in the study, twenty eleventh graders and fourteen twelfth graders. On the Nelson-Denny Reading Test, Form D, these students' grade equivalent reading levels averaged 10.4. The three primary reading sources used in these Auto Mechanics classes were written on the twelfth, tenth and eighth grade levels respectively.

Sherrill found in making an overall comparison of group reading level to grades earned that "The majority of students obtained a superior grade for the class work even though they would have trouble reading the material they are assigned to read and supposedly their primary source of technical information needed to succeed in the laboratory" (1978:34).

Holly O'Donnel (1982:474) notes that reading is necessary for employees in most vocational areas because jobs involve reading "instructions, specifications, codes, manuals, employee contracts, memoranda, occupational journals, employment notices, and the like."

Jay Thornton (1980) has studied the reading requirements of vocational education fairly extensively. He suggests that not only is reading ability important, but that in most areas it is

imperative. The type of reading required of vocational students is very technical, and because of the density of facts and the presumption of prior knowledge of the subject it is often more difficult to read than general reading material. Thornton refers to the use of reading ability as a part of the screening process in vocational classes at some schools.

The use of reading material in instruction makes an obvious case for its inclusion in the screening process. Other authors citing the value of reading ability to vocational education are Corman, 1980; Horne, 1979; Karnes and Ginn, 1976; Perine, 1980; Shuman and Conroy, 1980; Stephenson and Ward, 1978; and Visinski, 1981.

Lunneborg (1970:3) notes that "Vocational grades are apparently unwittingly influenced by the student's ability to read, to express himself verbally, to write coherently, etc." Her belief is that each student should know as much as possible about himself or herself, including reading skills and/or limitations in order to make good career decisions.

In summarizing the literature there is little to suggest that students, particularly in beginning level vocational courses, must be able to read well to succeed in those courses. It does suggest that success in a career may be dependent upon reading ability especially when technical manuals must be used extensively.

CHAPTER THREE

Procedures

In chapter three the subjects of the study are identified, the data collection methods are described, and the statistical treatment of the data is explained.

Subjects of the Study

The subjects of this study were thirty-eight tenth grade students who were enrolled in Auto Mechanics I classes at Alexander Central High School, Taylorsville, North Carolina, during the 1982-83 school year. Table I lists first semester Auto Mechanics I grades, DAT Mechanical Reasoning raw scores, self-reported career interest levels, and California Achievement Test grade-equivalent reading levels for the students. Two students who did not take the California Achievement Test were eliminated from the comparison of grades to reading levels.

Data Collection

The data used in this study includes some of the student information which is readily available in most schools. Specifically in this study students' first semester grades in Auto Mechanics I are compared to their raw scores on the DAT Mechanical Reasoning subtest, to their self-expressed interests in careers as auto mechanics, and finally to their California Achievement Test

TABLE I

Auto Mechanics I Grades, DAT Mechanical Reasoning Subtest
Raw Scores, Self-Expressed Career Interest Levels,
CAT Grade-Equivalent Reading Levels

N	A	B	C	D
Students	Auto Mechanics I - 1st Sem. Grades	DAT Mechanical Reasoning Subtest Raw Scores	Self-Expressed Career Interest Level Scores	CAT Grade- Equivalent Reading Levels
1	96	59	3	12.9
2	95	57	4	8.0
3	94	57	4	8.4
4	93	50	1	8.4
5	93	47	3	10.0
6	93	46	4	9.6
7	92	62	3	10.0
8	92	55	3	12.1
9	92	53	4	9.0
10	92	45	4	8.0
11	91	58	4	12.3
12	91	56	3	8.0
13	91	54	4	7.3
14	91	50	4	8.1
15	90	53	2	8.5
16	90	52	2	6.9
17	90	51	1	10.9
18	90	50	4	7.7
19	90	45	4	8.0
20	90	43	3	9.4
21	90	43	4	8.1
22	89	62	3	10.5
23	88	50	4	9.5
24	87	47	2	7.7
25	87	42	4	8.6
26	87	36	2	7.4
27	86	55	4	7.1
28	86	54	3	8.9
29	86	48	4	7.6
30	86	36	4	8.7
31	85	57	3	7.4
32	85	29	4	
33	83	65	2	12.9
34	82	45	4	7.4
35	82	44	3	5.5
36	82	43	3	7.5
37	77	23	2	5.2
38	77	21	2	

grade-equivalent reading levels. Grades, DAT scores, self-expressed interest reports, and CAT reading levels can generally be found in the school guidance office and are accessible to any school personnel.

Auto Mechanics I Grades

Grades in Auto Mechanics I classes are assigned by the instructor based on student performances on written assignments, tests and hands-on shop experiences. Grades are assigned on a scale of 0-100.

Mechanical Reasoning Subtest of the Differential Aptitude Test

The Mechanical Reasoning subtest of the DAT consists of seventy figures noting a mechanical relationship, together with a simply worded question about the relationship. The figures demonstrate simple, frequently encountered mechanical relationships which require no specialized skill or knowledge. According to the DAT Test Administrator's Handbook (1982:9) "Occupations such as . . . mechanic . . . require the kind of understanding this test measures." The subtest was administered in the fall of 1982 to all Auto Mechanics I students at Alexander Central High School. Form V of the test was used. The tests were hand-scored, and the students' raw scores were used in the statistical analysis for this study.

For ninth grade males the DAT Mechanical Reasoning subtest, Form V, yields a .90 reliability coefficient, based on a correlation of odd and even scores, corrected by the Spearman-Brown

formula. The standard error of measurement for ninth grade males on this test is 3.6, which was calculated from the split-half reliability coefficients.

The DAT fifth edition Technical Manual notes a .16 validity coefficient between Auto Mechanics grades and the Mechanical Reasoning subtest, Form T, for tenth graders and .28 for eleventh graders. The validity study included forty tenth graders and forty-two eleventh graders.

Self-Expressed Career Interest

The self-reported interest in an auto mechanics career came from a survey conducted in the spring of 1982 with all ninth graders in Alexander County. A prepared form listing job opportunities usually available to high school graduates was used for the survey. Students checked their first, second and third career choices or noted that they did not find an occupation on the form which they would wish to pursue. In order to perform statistical operations on these choices a score of four was assigned to a first choice, a score of three to a second choice and a score of two to a third choice of a career in auto mechanics or the related careers of heavy-equipment repair, auto body repair, machinery or diesel mechanics. Those students who indicated none of these as a first, second or third choice were assigned a score of one after indicating auto mechanics or a related career as their fourth career choice. These scores indicate students' self-expressed career interest levels.

California Achievement Test Grade -
Equivalent Reading Level

The California Achievement Test, Level 18, is administered to all students during the spring of their ninth grade year as part of the North Carolina Annual Testing Program. The subjects' spring, 1982 CAT grade-equivalent reading levels, machine scored, were used in the statistical analysis for this study.

For ninth graders the CAT Reading section yields a .89 alternate form reliability coefficient according to the Technical Bulletin.

The content validity of the CAT was established during test development in the formulation of test objectives. Curriculum guides and instructional materials from all state departments of education and most major cities in the United States were reviewed to identify basic skills which are common to most curricula. Once the objectives were established test items were developed to measure the specific skill. The test publisher offers no statistical studies of validity on the California Achievement Tests.

Statistical Procedure

For the purpose of treating and summarizing the data of this study the relationship between the variables was calculated using the Pearson product-moment formula. This calculation noted the relationship between first semester Auto Mechanics I grades and each of the three variables, aptitude as measured by the Mechanical Reasoning subtest of the Differential Aptitude Test, Form V; interest level as indicated on a self-expressed career interest survey; and grade-equivalent reading level as measured by the

California Achievement Test, Level 18. The .05 level of confidence was selected for determining significance.



CHAPTER FOUR

Analysis of Data

Chapter four presents an analysis and description of the correlations between Auto Mechanics I grades and aptitudes, interests and reading levels.

Null Hypothesis I

Null Hypothesis I states that there is no correlation at the .05 level of confidence between the scores obtained by students on the Mechanical Reasoning subtest of the Differential Aptitude Test and first semester grades in Auto Mechanics I. Table II presents data indicating the correlation between the grades and the raw scores obtained on the aptitude test. The Pearson product-moment formula was used to calculate the correlation.

The correlation of .5937 is significant at the .01 level, thus allowing the null hypothesis to be rejected for this relationship.

Null Hypothesis II

Null Hypothesis II states that there is no correlation at the .05 level of confidence between students' self-expressed career interest levels and first semester grades in Auto Mechanics I. Table II presents data indicating the correlation between grades and the scores assigned students on the basis of their

self-expressed interests in auto mechanics careers. The Pearson product-moment formula was used to calculate the correlation.

The correlation of .4239 is significant at the .01 level, thus allowing the null hypothesis to be rejected for this relationship.

Null Hypothesis III

Null Hypothesis III states that there is no correlation at the .05 level of confidence between the grade-equivalent reading level scores obtained by students on the California Achievement Test and first semester grades in Auto Mechanics I. Table II presents data indicating the correlation between grades and reading levels using the Pearson product-moment formula.

The correlation of .3142 is not significant at the .05 level; thus, the null hypothesis is accepted.

TABLE II

Correlation Data Comparing Auto Mechanics I Grades to DAT
 Mechanical Reasoning Subtest Scores, Self-Expressed
 Career Interest Level Scores and CAT
 Grade-Equivalent Reading Levels

Variable	N	Mean	r
Differential Aptitude Test Mechanical Reasoning	38	49	.5937*
Self-Expressed Career Interest Level	38	3.2	.4239*
California Achievement Test Grade-Equivalent Reading Level	36	8.7	.3142

*Significant at the .01 level.

Summary

The correlation measured herein between first semester Auto Mechanics I grades and aptitudes as presented by the Mechanical Reasoning subtests of the Differential Aptitude Tests, Form V, is significant at the .01 level of confidence.

The correlation measured herein between first semester Auto Mechanics I grades and interest level as indicated on a self-expressed career interest survey is also significant at the .01 level of confidence.

The correlation measured herein between first semester Auto Mechanics I grades and grade-equivalent reading levels as presented by the California Achievement Test is not significant at the .05 level of confidence.

CHAPTER FIVE

Summary, Conclusions, Implications and Suggestions for Further Research

A summary of the study, conclusions derived from the data, implications presented by statistical analysis of data and suggestions for further research make up chapter five.

Summary

The purpose of this study was to note the correlation of criteria which are generally readily available in high schools to the grades earned by students in Auto Mechanics I classes. The criteria selected for this study were measures of aptitudes, self-expressed career interests and grade equivalent reading levels.

Literature dealing with aptitudes, interests and reading levels as they relate to vocational study was reviewed.

The subjects of the study were thirty-eight tenth grade Auto Mechanics I students at Alexander Central High School.

In the fall of 1982 the subjects took the DAT Mechanical Reasoning subtest, and the raw scores were compared to Auto Mechanics I fall semester grades. The Pearson product-moment formula was used to calculate the correlation.

The subjects reported their interests in an auto mechanics career in a spring, 1982 survey. Scores assigned to these

self-expressed interests were compared to Auto Mechanics I first semester grades. The correlation was calculated by the Pearson product-moment formula.

Reading levels for thirty-six of the subjects were obtained from the spring, 1982 administration of the California Achievement Test. These, too, were compared to Auto Mechanics I fall semester grades using the Pearson product-moment formula.

This study reveals a significant relationship between Auto Mechanics I grades and aptitudes and interests respectively, but a statistically significant relationship between grades and reading levels is not noted.

Conclusions

The results of this study seem to indicate a more statistically significant relationship between grades earned in Auto Mechanics I classes and aptitudes and interests than the literature suggests. A point of emphasis in the literature is that numerous factors influence one's success in a course of study or on a job. Certainly this study, while attempting to note the relationship of aptitude, interest and reading level to the study of Auto Mechanics I, does not suggest that these are the only determinant factors for success.

Although previous studies deal very little with attempts to predict success in a specific secondary vocational curriculum, it seems logical to conclude that aptitude is an influential factor in one's subsequent success or failure in a course of study.

A finding of this study notes a moderately high Pearson product-moment correlation coefficient of .5937 between mechanical reasoning as presented by the DAT Mechanical Reasoning subtest and first semester grades earned in Auto Mechanics I. This correlation coefficient is significant at the .01 level indicating a real relationship between the two variables. This supports the prevailing attitude in the literature that aptitude should be a factor in guiding students toward a suitable course of study.

The literature dealing with interests accepts the logic that one's interest is important to his or her success in a career. The main point of contention in the literature is whether inventoried or expressed interests are better measures of individuals' actual interests. There is no consensus of opinion on this matter.

This study uses self-expressed career interest levels because they are easily obtained and can be justified since students begin to study careers extensively in junior high schools now in most areas. Studying careers enables students to be aware of career demands and preparations, thus, making them able to compare these to their interests, capabilities and so forth. Their expressed career interests, then, are based upon their knowledge both of themselves and of the careers to which they aspire.

A Pearson product-moment correlation of .4239 is noted between self-expressed career interest levels and Auto Mechanics I first semester grades in this study. This is a low-moderate correlation which is significant at the .01 level indicating a real relationship between the variables. This indicates that career interest

should also be a factor in guiding students toward a suitable course of study.

No statistically significant relationship between grade-equivalent reading levels, as presented by the California Achievement Test, and Auto Mechanics I first semester grades was noted in this study. A low Pearson product-moment correlation of .3142 was found which is not significant at the .05 level.

The literature also does not indicate a satisfactory statistical correlation between reading level and success in a course of study to prepare one for a specific career. It does, however, speak strongly to the need to read as an important factor in career success particularly in areas requiring the use of technical manuals.

This study only takes into account those students who are enrolled in the first level of an auto mechanics curriculum which consists of three levels. Students in the first level do not refer to technical manuals at all; rather they use the textbook Automotive Mechanics written by William H. Crouse. This investigator, using the Frye Readability Scale, found the textbook is written on a ninth grade reading level. The average California Achievement Test grade-equivalent reading level of the Auto Mechanics I students in this study is 8.7.

No student in the study failed the course despite the fact that twenty-four of the thirty-six students, who had reading levels tested, were reading below the text level. This can to some extent be explained by the instructor's use of a number of visual aids, and by having twenty-five percent of the grade based on hands-on

work on displays. The overall reading level of these students does approach the text level. Given these factors the positive correlation of .3142 may be somewhat notable at this first level of instruction, wherein it can be surmized that reading is not a major part of the course load.

Overall this study indicates that aptitudes and career interests are important factors in the selection of a course of study leading to a specific career. Although neither the literature nor this study shows a statistically significant relationship between reading and selection of a course of study, a good case is made in the literature supporting reading ability as important to various aspects of career development.

Implications

There is a convincing body of literature to support the idea that numerous factors influence one's success or failure in a course of study. The literature cited, and the statistical relationships noted herein, give support to the hypothesis that there is a positive relationship between grades earned in Auto Mechanics I and aptitudes and career interest levels respectively. The literature also emphasizes the value of reading ability to the study of vocational curricula, even though the current study does not note a statistically significant relationship.

One implication of this study is that one's aptitude, which enables him or her to acquire with training certain specific skills, knowledge or abilities, is important to the pursuit of a course of study involving such skills, knowledge or abilities.

A second implication is that a self-expressed interest in a specific career is an important factor in the successful study of a curriculum designed to prepare one for such a career.

The evidence indicates that at some point, or in some specific instances, e.g. reading technical manuals, reading ability is important to successful preparation for a career. However, the implication is that other factors may override the importance of general reading level to success in a course of study. Perhaps a student can acquire certain basic information in various ways and can even understand reading material sufficiently well to supplement his or her hands-on learning enough to succeed in vocational curricula. This may further imply that motivation and other factors influence one's acquisition of knowledge beyond his or her basic reading level.

It may also be that reading level increases when a student is reading something of particular interest or about something which he or she understands. That the material is fact-dense and very technical probably does not present as much of a problem to someone who understands the facts and the technical jargon as it would to the general reader.

As Holland (1975:421) observes "it is possible that some types (of people) make better vocational decisions than others because they perceive themselves and the world more accurately." This statement seems to summarize well the overall implication of this study that students, teachers, counselors and administrators should take into account many factors when considering a course of study. Furthermore, perhaps the best career assistance students can

receive is to be helped to understand themselves, their capabilities, their interests, and their motivations as well as possible and to be as knowledgeable as possible about all facets of careers and preparatory curricula.

Suggestions for Further Research

Other factors which are likely to influence success in a vocational curricula were suggested in researching the relationship of the specific factors of aptitude, interest and reading level to that success. Noting the relationship of success to such factors as parental support, parents' occupations, persistence, motivation, overall academic ability, family income, perceptions of career status, peer acceptance, and so forth would make for some interesting further research in this field.

Studies using the factors aptitude, interest and reading ability as they relate to more advanced study or to actual career acquisition could also be conducted.

The research methods noted herein could be applied to other specific vocational curricula. If students continue to seek job-entry skill acquisition in high schools, better and more specific screening for other courses such as carpentry, masonry, electricity and so forth may have to be developed.

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APPENDIX A
Career-Interest Survey Form

ALEXANDER COUNTY SCHOOLS

OCCUPATIONAL INTEREST SURVEY

Date _____

Student's Name _____ Sex _____ Grade _____

School _____ Teacher's Name _____

NOTE TO STUDENT: Please read the following instructions before completing the survey form.

- °The job opportunities listed on the reverse side of this sheet are usually available to high school students who have completed a prescribed program in vocational education while in high school or who have completed a prescribed program in a post-secondary institution. The list does not include occupations which normally require a degree from a four-year college or university.
- °Read through the entire list of occupations before indicating your choices.
- °Indicate your first (1st), second (2nd), and third (3rd) choice of an occupation that most nearly represents the kind of work you would like to do when you complete your schooling.
- °First choice should be shown by a check (✓) beside the occupation in the first choice column.
- °Second choice should be shown by a check (✓) beside the occupation in the second choice column.
- °Third choice should be shown by a check (✓) beside the occupation in the third choice column.
- °There should be no more than three (3) checks on the entire survey form.
- °If, after reading the entire list, you do not see an occupation which you would like to pursue, then write in your first, second, and third choice of an occupation in the spaces provided at the end of the survey form.
- °If you have any questions, ask your teacher.

TURN TO THE REVERSE SIDE OF THIS SHEET AND COMPLETE THE OCCUPATIONAL INTEREST SURVEY FORM.

OCCUPATIONS	CHOICES		
	1st	2nd	3rd
<u>AGRICULTURE RELATED:</u>			
Forestry occupations (pulpwood, lumbering)			
Gardner, groundskeeper			
Farmer (owner, tenant)			
Farm worker			
Farm manager			
Agricultural processing, inspecting, marketing			
Conservation			
Agricultural technician			
Animal caretaker			
Farm services (machinery, supplies, services)			
Horticulture (nursery, landscaping)			
<u>BUSINESS & OFFICE RELATED:</u>			
Secretary			
Stenographer			
Typist			
Bookkeeping, billing operator			
Data Entry operator			
Other office machine operator			
Bookkeeping			
File clerk			
Payroll, time keeping clerk			
Receptionist			
Telephone operator			
General office			
<u>DISTRIBUTIVE EDUCATION RELATED:</u>			
Sales (retail, wholesale, service)			
Billing clerk			
Cashier			
Shipping/receiving clerk			
Ad agency representative			
Ad layout			
Display			
Salesperson of radio and TV time			
Reservation clerk			
Financial services			
Counter person for auto parts			
<u>HEALTH OCCUPATIONS RELATED:</u>			
Hospital or ambulance attendant			
Dental assistant			
Health aide (except nursing)			
Nurses aide			
Orderly			
Practical Nurse			
Sanitarian (public health inspector)			

OCCUPATIONS	CHOICES		
	1st	2nd	3rd
<u>HOME ECONOMICS RELATED:</u>			
Baker			
Tailor			
Clothing ironer, presser			
Cutting operative			
Sewer, stitcher			
Cook			
Food counter, fountain worker			
Waiter, waitress			
Food worker			
Child care worker			
Home furnishing services			
Management aide			
<u>TRADES AND INDUSTRIES RELATED:</u>			
<u>Mechanics--</u>			
Air conditioning, heating, refrigeration			
Aircraft			
Auto body repair			
Auto mechanics			
Heavy equipment, machinery, diesel			
Household appliance mechanic			
Garage worker, gas station attendant			
Other mechanic and repair			
<u>Electronics--</u>			
Electrician			
Radio, TV repair			
Home entertainment equipment			
Industrial electronic controls			
<u>Woods--</u>			
Carpenter			
Painter, construction			
Roofer, slater			
Cabinetmaker			
Furniture and wood finish			
Upholsterer			
Dry wall installer, lather			
Filer, polisher, sander, buffer			
<u>Cosmetology--</u>			
Barber			
Hairdresser, cosmetologist			
<u>Metals--</u>			
Machinists			
Sheet metal workers, tinsmith			
Grinding machine operative			
Lathe milling machine operative			
Other precision machine operative			
Welder and flame cutter			

OCCUPATIONS	CHOICES		
	1st	2nd	3rd
<u>TRADES AND INDUSTRIES RELATED (Continued):</u>			
<u>Graphics--</u>			
Compositor and typesetter			
Pressman and plate printer			
<u>Textiles--</u>			
Knitter, looper, and topper			
Spinner, twister, winder			
Weaver			
Other textile			
<u>Other--</u>			
Brickmason and stonemason			
Plumbing and pipefitters			
<u>SERVICE RELATED AND OTHERS:</u>			
Commercial fishing, marine occupations			
Communications			
Chambermaid, maid			
Cleaner, charwoman			
Janitor, sexton			
Housekeeper			
Maid, servant			
Packer, wrapper (not meat, produce)			
Military (full career)			
Surveying			
Drafting			

I have read the above list and do not find any occupations listed which I would like to pursue. Following is the listing of my first, second, and third choices of an occupation.

(First Choice)

(Second Choice)

(Third Choice)

APPENDIX B

Vita

VITA

Jean P. Reid was born in Lenoir, North Carolina, on June 10, 1950. She attended elementary schools in Caldwell County and graduated from Hibriten High School in June, 1968. The following September she entered Appalachian State University, and in May, 1972, she received a Bachelor of Science degree in Social Science. In the fall of 1972 she began teaching at Alexander Central High School.

In 1974 she enrolled as a student in the Department of Guidance and Counseling at North Carolina State University. She also worked in the University Student Union. In the summer of 1975 she began work toward a Master's Degree in Counselor Education at Appalachian State University and returned to teach at Alexander Central High School that fall. The Master's Degree was awarded in 1977, and Mrs. Reid became a counselor at Alexander Central High School in January, 1978.

In the summer of 1980 Mrs. Reid began course work toward a Specialist in Education degree from the Counselor Education Department at Appalachian State University. The degree will be conferred at the summer, 1983 commencement.

The author is a member of the National Education Association, North Carolina Association of Educators, Support and Post-Secondary Personnel division of NCAE, North Carolina School Counselors'

Association, North Carolina Coaches' Association, and the North Carolina Recreation and Park Society.

Mrs. Reid's address is Route 6, Box 799, Taylorsville, North Carolina.

Her parents are Mildred T. and Dudley D. Pennell of Lenoir, North Carolina. She is married to R. Dean Reid of Taylorsville.