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ABSTRACT

There is a need for improved techniques for selection of students and prediction of student success in vocational-technical education. This study concerns identification of the kinds of readily available data which may be used to predict student success in Pennsylvania area vocational-technical schools and to differentiate among the vocational-technical curriculums. Such data should be useful in helping students to decide whether or not to attend a vocational school and what course options would be most appropriate. A literature review showed no universality of methods, although it appeared that the use of a multiple set of predictors was preferable to single predictor variables. The purpose of this investigation was to analyze existing information about a sample of vocational school students in order to determine whether there were data readily available to school counselors which would be useful in planning study at the State vocational-technical schools. Only information already available in the junior high schools was used. Findings from analysis of the data caused the researchers to question the advisability of using the data studied for State selection methods. Further research is suggested to investigate both these and other data, if school planning is to make use of the study findings. Findings are appended in 28 tables. (MF)

Preliminary Final Report

The Development of Selection Models for Pennsylvania Area Vocational Technical Schools Phase I, Uses of Available Data

By

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Part I

Background and Statement of the Problem

Regarding vocational-technical education in general, Stock and Pratzner (1969) allude to the need for improved techniques for selection of students and prediction of student success. Reasons given for this need include accelerated enrollment in vocational-technical education curricula, expanding operation costs and shortages of instructional personnel; all of which emphasize the importance of the problem to the institution. In addition to these institutional concerns, it is also necessary to be sensitive to the failure and frustration of unsuccessful students in vocational-technical curricula. Such a realization has led to a desire to find more effective ways of helping students to make decisions which will be most beneficial to their welfare. It develops, then, that both institutional and individual needs will be served by the improvement of techniques for selection and for prediction of success in vocational-technical curricula.

Pennsylvania, in ways similar to other states across America, is fulfilling its commitment to the need for vocational-technical education via a network of Area Vocational Technical Schools at the secondary school level. These schools provide a spectrum of course offerings that are, in some cases common across schools and in others a reflection of local needs. Hughes and Gallagher (1970) point out that guidance services in these schools are a function of both the vocational school and sending school.

Further, it appears that a comprehensive guidance service for the maximum benefit of the institution and the individual requires that counselors in the vocational and home schools work as a team. More specifically, Hughes and Gallagher see the function of the home school counselor to be that of screening and recommending students for vocational-technical school programs, as well as related personal and social counseling when needed. Once the student has entered the vocational-technical school, the vocational school counselor should be available to assist that student in career development and job placement.

The home school counselor is faced with a dual problem. From the institutional vantage point he is viewed as a gatekeeper in terms of student movement into particular Area Vocational Technical School (AVTS) courses. Because of the quota system which presently prevails between the AVTS and its sending schools, home school counselors are essentially forced to make the choice among those students seeking acceptance. The second facet of the counselor's problem concerns individual guidance. They are frequently called upon to assist students who are attempting to decide whether or not to attend the AVTS and, if they have decided to attend, to help decide what course option is most appropriate for them.

Because the home school counselors are cast in the dual role of institutional gatekeeper and counselor of individuals, the expectation is that they have the necessary data available to them when performing these roles. By "necessary data" is meant those kinds of "statistical bridges" which are spoken of by Goldman (1971). Statistical bridges, in this context, are those actuarial means of bridging the gap between available data such as test scores or school grades and interpretation of the meaning of those data. The kind of statistical bridges which are needed in the context of the home school counselor's role mentioned above are discriminant; attempts to answer the question of to which curriculum group the individual is most similar, and the regression bridge, which attempts to predict relative chances of success in a chosen curriculum. In summary, the home school counselors need to be able to choose those applicants with the greatest chance to succeed in a given course option or else to help students to decide upon a course option given some data relative to his chances of success in various option. Related to this is the need to determine statistically where a student may best "fit" among the various vocational-technical curricula. Such discriminant data will be of help to both the institution and the individual student.

The foregoing discussion has stated what one would hope the home school counselor has available to him in order to fulfill the dual role expectations of institutional gatekeeper and counselor of individuals. In reality, the home school counselors of Pennsylvania have little or no data representative of the discriminant and regression bridge available to them. Excerpts from the accumulated responses to a questionnaire completed by the responsible guidance person in thirty-nine of the AVTS's seem to support this contention: "We use the test scores of the sending schools. They differ from school to school." "We feel standardized testing is not one of the important criteria for student selection. Past achievement, attendance, teacher recommendation or evaluation, etc., are more important. How could you enter the underprivileged on a test score?" "Our home high schools select all students, some perhaps use tests; we designate none." "We use whatever I.Q. scale and testing home schools have done. It is not up to the AVTS to dictate home school testing programs."

From these excerpts it appears that the data being used to fulfill the gatekeeping and counseling functions are basically normative. According to Goldman (1971) the normative bridge allows one to compare data available on an individual to similar data about a relatively representative group. One attempts to determine how he compares to others. Usually the comparison is in the ordinal form. Normative data does not allow one to answer questions related to chances for success or similarities to specific reference groups. As such the normative bridge, by itself, is an incomplete bridge.

Two avenues have been determined for rectifying the incomplete bridge situation. One avenue is to develop or select specific instruments to be used across all home schools in Pennsylvania as a standardized set of predictors and classifiers. Researchers are presently testing these instruments in order to validate their use in the future.

A second avenue entails the use of data already commonly available to home school counselors in the seventh, eighth and ninth grade cumulative records of potential AVTS students. Examples of such data are:

1. Achievement patterns in specific junior high school courses or in clusters of these courses.
2. Test scores on single or part-score scholastic aptitude tests.
3. Test scores on measures other than scholastic aptitude such as are found in multiple aptitude test batteries.
4. Interest inventory results.
5. Achievement test results.
6. Demographic information such as parental occupation and education, number of siblings and the like.
7. Student sex.

The purpose of this study is to develop discriminant and regression bridges from the data available in these cumulative records. Such bridges should be useful for home school counselors in their attempts to fulfill the demands of their gatekeeper and counselor roles for the AVTS's and their student populations. In summary, the rationale of this study is that there is a need to identify those kinds of data which are readily available to counselors and other educators in junior high school and AVTS student records which can be used to predict student achievement in various AVTS curricula and to successfully differentiate similarity among the vocational-technical curricular groups. The assumption behind this study is that the identification of such data will be useful in enhancing student choice among possible alternatives as well as for planning purposes by state and local decision-makers.

Part II

Review of Related Literature

A review of the literature was conducted in order to acquire background information relative to this study. For the purpose of presenting the information examined in this search, the review of related literature was divided into three sections which are as follows:

1. Introduction.
2. Studies related to the regression bridge.
3. Studies related to the discriminant bridge.

Introduction

Because of the nature of this project, the review of related literature has been restricted to studies which attempt to predict success or to classify subjects in secondary school samples. The rationale behind this decision is based upon the fact that this study proposes to analyze and evaluate existing data from the junior high school records of the sample subjects. The purpose of the analysis and evaluation is to develop selection models and "statistical bridge" data for decision-makers and counselors which will be used prior to entrance into the secondary schools. In summary, the concern of this review is with professional literature addressed to the same purpose--that of using junior high school (grades 7, 8 and 9) data to facilitate institutional and individual decisions prior to entrance into senior high school (grades 10, 11, and 12) vocational-technical programs.

Studies Related to the Regression Bridge

In his forword to Stock and Pratzner's (1969) review of research or selection and prediction of success in occupational education, Moss states that knowledge about individual student factors which make for success in vocational programs is of great potential value. However, he laments the disappointing state of this knowledge. More specifically, he feels that the predictions are inefficient and generalizable results are scarce. When the population is limited to secondary school students the scarcity of data is amplified.

Prior reviews of the literature related to the student selection/prediction of success problem have been undertaken by Patterson (1956), Prediger, Waple and Nusbaum (1968) and Stock and Pratzner (1969). These reviews serve as focal points, calling attention to studies that have been undertaken from the 1920's through the 1960's.

Patterson (1956), upon reviewing a number of studies, not all of which are applicable to the problems of the sample in this research project, concludes that certain tests, and certain types of tests, consistently show significant relationships to success in trade school courses as measured by shop grades or ratings of shop work. Tests of verbal ability or general intelligence appear to bear some relationship to success as do tests of visualization (or spatial relations), tests of mechanical experience and tests of arithmetic or mathematics.

Data reviewed by Patterson (1956) leads him to suggest that different levels of vocational-technical training may vary in requirements but, in general, the different trades require similar abilities. Finally, he concludes that it should be possible to select a battery of tests which will combine to yield fair predictions of success in vocational-technical training. He surmises that this battery will probably consist of a verbal intelligence test, a test of mechanical information or experience, a test of spatial ability, and possibly an interest test. Patterson includes the interest test not because of studies he has reviewed, but because of his own personal suspicion that such information may have predictive value.

Several studies cited in Patterson's (1956) review deal with a sample similar to the population of interest in this research. Fleming (1938, 1939) found that IQ is related to persistence in school (completion of the course of studies). Other studies dealing with the IQ are reported by Novak (1941) and Hankin (1947). In a rather inadequate statistical study, Novak found that intelligence is not related to first year grades in mechanical trades courses at a Philadelphia vocational high school. Hankin's study took place in the same school at a later date using subjects from machine design and drafting courses. He found that the IQ is of little value in differentiating among degrees of achievement.

Novak and Schuehing (1951) correlated junior high school grades with grades received by male subjects in high school auto and electric shop courses. The two best predictors for auto shop were a junior high school arithmetic fundamentals test (.35) and junior high school shop grades, junior high school English grades, and junior high school math grades, all of which yielded a correlation coefficient of .34 with the criterion. The two best predictors of high school electric shop course grades were found to be junior high school grades in science (.60) and a junior high school reading test (.35). In both cases the two top predictors were different for one criterion than for the other.

Prediger, et al (1968) reported on over 1,200 single predictors of grade point average in vocational education programs from thirty-eight studies appearing in the professional literature from 1954 to 1967. In their study, they designated ten predictor categories (verbal intelligence and academic aptitude; nonverbal intelligence and abstract reasoning; arithmetic reasoning and computation; spatial aptitude; mechanical principles, comprehension, knowledge and reasoning; perceptual speed and accuracy; manual dexterity; specific purpose aptitude tests; past grades; and achievement test data) and eleven vocational program areas (auto mechanics, carpentry, drafting, electricity, machine shop, industrial arts, business education, bookkeeping, shorthand, typing and home economics). The major findings included a substantial variation in the results from study to study, differences in level of predictor-criterion correlation coefficients among vocational areas and between males and females, evidence of differential predictability, and poor performance of dexterity tests.

Evidence of differential predictability is seen in the following summary of the two best predictors in each of the eleven vocational program areas:

Auto Mechanics	Nonverbal intelligence (.23) Mechanical (.23)
Carpentry	Mechanical (.27) Spatial aptitude (.24)
Drafting	Spatial aptitude (.42) Verbal intelligence (.39)
Electricity	Spatial aptitude (.34) Achievement test data (.24)
Machine Shop	Mechanical (.44) Nonverbal intelligence (.43)
Industrial Arts	Nonverbal intelligence (.33) Verbal intelligence (.30)
Business Education	Arithmetic reasoning and computation (.48) Achievement test results (.46)
Bookkeeping	Verbal intelligence (.44) Achievement test results (.39)
Shorthand	Grade point average (.56) Specific purpose aptitude tests (.51) Achievement test results (.51)
Typing	Specific purpose aptitude tests (.38) Achievement test results (.36)

Home Economics   Nonverbal intelligence (.46) Arithmetic reasoning and compulation (.44)

Summing the two best predictors over the eleven vocational area categories gives a resultant total of seven different predictor categories. As the authors indicate, there is evidence that certain predictors are more useful in some vocational-technical course subjects than are others. Such a finding is somewhat contradictory to Patterson's (1956) earlier argument for a single test battery.

Stock and Pratzner (1969) reported and synthesized research findings relative to the selection of students and the prediction of student success in occupational education which have been conducted since 1960. The following paragraphs present a summary of these findings.

It seems apparent to Stock and Pratzner that aptitude testing alone is not the whole answer to the student selection/prediction problem. They see evidence that other variables, such as interest and motivation may act to influence student behavior and thus must be studied or controlled. These studies also confirm the earlier work of Patterson (1956) and Prediger, et al (1968) which find that, in general, motor ability tests are of negligible value in the selection-prediction process. In fact, the best predictors of future performance in training programs, cognitive as well as noncognitive, have typically been intellective measures of cognitive ability (such as IQ, reading and arithmetic) and/or measures of past academic achievement in the "solid subjects" (such as English and mathematics).

When synthesizing studies which attempt to predict completion of vocational-technical education programs, a paucity of such studies appears, thus making validation difficult. Available studies reveal that ninth grade attendance, ninth grade combined academic average, age at entry into the program and intelligence scores are among the better predictors of program completion. The most noticeable difference between studies predicting achievement and ´ se predicting completion is a greater use of nonintellectual variables in the predictor equations for completion.

The Stock and Pratzner paper reveals several studies which offer information relative to specifically selected predictors for specifically selected vocational-technical education courses. Ingersoll and Peters (1966) studied the relationship between the nine aptitude scores on the General Aptitude Test Battery (GATB) and grades in forty-two subject matter courses for ninth and tenth grade boys and girls. Relevant findings were a multiple correlation of .492 between tenth grade home economics grades and GATB Verbal, Numerical, Spatial and Clerical Perception scores and that Form Perception and Verbal Aptitude were significant contributors to the tenth grade mechanical drawing equation (.621).

Long (1959) researched the relationship between selected junior high school grades and grades subsequently earned in five different vocational-technical school areas. Specific findings indicated that math grade-point-average is the best overall predictor of success for boys and girls. In addition, reading comprehension scores were one of the best predictors for boys and girls while social studies grade-point-average contributed significantly to the prediction of success for boys but not for girls. Science grade-point-average was the poorest predictor.

Similar findings were reported by Racky (1959) and Croft (1959). In the Racky study predictors consisting of interest, aptitude and personal information measures produced a multiple correlation coefficient of .686 with woodshop performance. Of this battery, the pertinent environmental information and mechanical aptitude measure correlated higher with woodshop grades than did any of the other predictors. Croft (1959) successfully predicted achievement of high school girls in clothing construction with a battery consisting of a clothing construction test, a survey of object visualization and a finger dexterity questionnaire.

Casey and Heemstra (1965) reported that IQ, rank in class, English grades and total junior high school grade-point-average were significantly related to letter grade rank in class for shorthand students. Finally, Doppelt, Seashore and Odgers (1959) found that one or more of the subtests of the Differential Aptitude Test (DAT) is a good predictor of teacher ratings for eleventh and twelfth grade machine shop students. They recommend using the sum scores on Abstract Reasoning, Space Relations and Mechanical Reasoning as a predictor of machine shop student course performance in grades eleven and twelve.

Studies of predicting the capability of completing a secondary school vocational-technical program, in general, utilize standardized tests and/or biographical data. Witten's (1961) study of an all black sample found that the best predictors of persistence in and graduation from a vocational-technical program are ninth grade attendance, ninth grade combined academic average, age at entry and intelligence. Ninth grade attendance was the best single predictor of vocational school attendance. This study also provided information relative to prediction of achievement. The significant predictors of secondary vocational school achievement were junior high school grades in industrial arts and home economics, intelligence, and other course grades.

Two other doctoral dissertations reported a relationship between arithmetic and persistence to completion of a vocational-technical curriculum. Carlin (1962) used a standardized test score in arithmetic achievement and found it to be the best single predictor among those included in his study. The course options in Carlin's study were automotive, electrical, and woodworking. Investigating predictive relationships for a sample of automotive mechanics students, Foote (1960) found that a standardized arithmetic computation test was the most significant single predictor of graduation.

Recently, Kapes (1971), studying the relationship between sixteen independent ninth grade predictor variables and tenth grade vocational grade-point-average for boys, found that success in vocational curricula is much less predictable than success in an academic curricula. The three variables which possess most of the unique information available are Verbal Aptitude, Numerical Aptitude (both measured by the General Aptitude Test Battery), and the occupational value, "prestige," as measured by the Occupational Values Inventory. Taken together, these variables account for less than twenty-seven percent of the variance associated with vocational grade-point-average.

Summary

Universal agreement does not seem to exist regarding whether one should use differential prediction of success for each of a variety of vocational-technical school course options or whether it is best to use a common set of predictors. Patterson (1956) recommends a common battery of tests while Prediger et al (1968) and Stock and Pratzner (1969) imply that differential prediction may be more feasible and productive. It does appear that all of these reviewers prefer and advocate the use of a multiple set of predictors as opposed to single predictor variables.

When the criterion measure is achievement in the vocational-technical school courses, various cognitive measures such as standardized tests and grades achieved in junior high school are the better predictors. However, when the criterion is completion or persistence, noncognitive predictor variables also appear to be useful. It must be noted that little research data are available in regards to the persistence criterion. As a result, much is still unknown about the prediction of persistence in vocational-technical courses at the secondary school level.

Studies Related to the Discriminant Bridge

The previous section of this review deals with studies of prediction pertinent to a single criterion such as persistence or success. When the criterion is membership in one or the other of more than two distinct groups, multiple discriminant analysis is appropriate (Impellitteri and Kapes, 1971). The basic question herein, is whether or not one is more similar in his measured attributes to the average membership of one or more of several groups who have been measured on the same attributes.

Investigating the relationship between selected scores on aptitude and interest variables (Dailey Vocational Test and The Minnesota Vocational Interest Inventory) and the selection of vocational-technical courses by eleventh and twelfth grade students, Doerr (1967) successfully differentiated curricular groups. Centroids for eight vocational groups were found to be statistically different. Two of the seven potential discriminant equations exhausted 86.7 percent of the discriminant power of the thirteen variables in the study. Using the maximum likelihood principle of classification, 46 percent of the valid sample were correctly identified with the actual vocational group. Using two or three of the largest probability values for each subject increased the accuracy of prediction of group membership to 63 percent and 72 percent.

Prediger (1969) demonstrated that students in various vocational programs can be differentiated by interest and aptitude measures. Interest measures appear to be somewhat more powerful than aptitude measures when combining male and female subject groups. In this study Prediger was able to reduce thirty-six independent variables to two discriminant functions which define a space on which twenty-two vocational programs can be plotted as points or centroids. Prediger (1971) has also successfully developed a novel graphic technique for reporting test results and facilitating decision-making by counselees.

A final sample of discriminant analysis is that of Kapes (1971). He found that the General Aptitude Test Battery aptitudes, Verbal and Numerical; the Occupational Values Inventory value, Prestige; the construct of Vocational Maturity as measured by the Vocational Development Inventory; and the socio-economic variables, father's occupation and level of occupational aspiration, appear to contain most of the discriminating information necessary to distinguish among successful and unsuccessful vocational and academic students.

Summary

It appears that few examples of discriminant analysis are available. However, of those which are available, reports indicate that successful discriminant functions are being developed. It should be noted that, in these successful examples, the researchers are using standardized predictor variables across all subjects in their samples.

Part III

Procedures Findings and Recommendations

Introduction

As stated in the research proposal, the purpose of this investigation was to analyze existing information about a sample of AVTS graduates and nongraduates in order to attempt to determine whether there were data readily available to school counselors which would be useful in enhancing student choice and planning relative to study at Pennsylvania State Vocational Technical Schools. Because of the nature of this investigation it was proposed that the researchers would attempt to answer the following questions:

1. Are the characteristics of students who achieve at various levels in specific courses constant across AVTS's?
2. To what degree can students achieving at particular levels in particular AVTS courses be differentiated on the basis of the data available on them in the seventh, eighth and ninth grade records?
3. Which independent variables available from the seventh, eighth and ninth grade records result in predicting the dependent variable (achievement in particular courses) most effectively.

As stated above, the intent of this investigation was to use only information already available in the junior high schools. This investigation did not attempt to introduce a new set of predictors.

Population and Sample

The potential population considered in the present investigation was all students who graduated or would have graduated from the Pennsylvania Area Vocational Technical Schools in the Spring of 1971. Owing to technical and administrative constraints, the population of interest was not sampled directly. Instead, a multi-stage sampling procedure was employed with AVTS's constituting the elements of the initial stage. In order to enhance the representativeness of the elements sampled at this stage, a stratified random sampling procedure was employed. Stratification was achieved by dividing the state into geographical regions, including one representative from the two major metropolitan areas (Philadelphia and Pittsburgh); and then randomly selecting elements from the defined regions and metropolitan areas. This procedure led to the selection of the following schools:

Centre County Area Vocational School
Columbia-Montour Area Vocational Technical School
Delaware County Area Vocational Technical School-Number One
Erie County Vocational Technical School
Fayette County Area Vocational Technical School
Juniata-Mifflin Counties Area Vocational Technical School
Lenape Area Vocational Technical School
North Montco Area Vocational Technical School
Parkway West Area Vocational Technical School
Philadelphia Mastbaum Area Vocational Technical School
Reading-Muhlenberg Area Vocational Technical School
West Side Area Vocational Technical School
York County Area Vocational Technical School

All of the students from each of these first-stage units were then considered. The resultant composite of all students from the class of 1971 in each of the thirteen AVTS's for whom data were available constituted the sample for the study. Prior to data analysis the sample consisted of 4,257 subjects.

Data Collection

The initial contacts explaining the purpose of the investigation were made by mail and telephone with the appropriate responsible persons at each institution. In all cases the individuals contacted agreed to participate. Descriptive materials were then mailed to each school as a means of providing explicit information relative to the needs and purposes of the study.

The major source of the investigative data was existing school records which, in most cases, included vocational-technical grades while in high school as well as records of student grades, standardized test scores, and personal data while in junior high school (grades seven, eight, and nine). In those instances where the AVTS had direct access to all of this information it was made available to the researchers with little delay. In other cases, the AVTS had to acquire the desired information from their feeder high schools. In these cases the data were then sent to the researchers. However, in the latter instances the time involved for data collection was of a longer duration.

Finally, there were some AVTS's in the sample which were unable to provide or secure the desired information after having made an initial effort. In these cases the researchers had to make contacts by telephone and mailed correspondence with the feeder high schools after acquiring the names of the appropriate sample subjects and their home high schools from the AVTS in question. The process was time consuming, as the number of schools involved was markedly increased by as few as seven or as many as fourteen feeder high schools. Although this process finally proved to be successful, the resultant time delay caused the researchers to fall behind the anticipated data collection, analysis, and writing schedule established in the research proposal. When dealing directly with the feeder high schools, the researchers acquired copies of the subjects' permanent records which contained junior high school information as well as AVTS grades earned while in high school.

Data Codification

As the purpose of this investigation was to analyze data commonly available to school counselors, the researchers were forced to wait until the total data set was obtained from the sample schools before identifying the variables to be considered for analysis. Prior to this stage, specific categories of information were identified (AVTS grades, English grades, math grades, intelligence test scores, aptitude test scores, achievement test scores, parental demographic data, interest inventory scores, etc.) However, specific listings within categories (e.g., test name) did not become available until all the data were accumulated. The listings were expanded as new data arrived (e.g., Kuder Interest Inventory, Iowa Test of Basic Skills, Otis Beta Intelligence Test, Differential Aptitude Test, etc.)

The information obtained for each subject was then assigned to each of eight data processing cards, whereupon it was coded for retrieval. Table 1 provides a listing of the specific variables assigned to each of the eight data cards.

Insert Table 1 about here

Preliminary Data Analyses

Data were collected for approximately 90-100 per cent of the students who were members of the class of 1971 in each of the thirteen AVTS included in the sample. Of these thirteen AVTS's, eleven operate on a shared-time basis. As a result, in these cases, each student body consists of pupils from several different feeder high schools. Several school systems constituted one AVTS district and, as a result, sometimes had their own unique standardized testing program and grading system. Accordingly, the distribution of the data on the eight cards was not consistent throughout. Tables 2 through 14 show the number of subjects within each AVTS and feeder school who had data appropriate for anyone of the eight data cards. The reader will note that numerous cases exist where there were no data available. This is especially true for data cards two through seven.

Insert Tables 2 through 14 about here

As noted above, inspection of Tables 2 through 14 shows that a considerable amount of missing data exists for the two through seven cards. At the same time, the data contained in the one and eight cards is shown to be fairly complete for each school. In that the purpose of this investigation was to develop selection models common to all AVTS's across the state of Pennsylvania, the researchers decided that the most appropriate first step in the development of such models would be an analysis of the kinds of data contained on the one and eight cards since these appear to represent the kinds of information that are commonly available. This decision eliminated Philadelphia Mastbaum because it did not provide eight card data. As a result the sample of AVTS schools was reduced to twelve.

Table 15 identifies the variables contained on data card number one and Table 16 shows which variables are found on the number eight card. In addition, information is provided relative to understanding of proceeding data from the analyses. The two variables involving father's and mother's occupations were obtained via the classification procedures described in the Dictionary of Occupational Titles (DOT). The specific categories used were:

1. Professional, technical and managerial occupations.
2. Clerical and sales occupations.
3. Service occupations.
4. Farming, fishing, forestry and related occupations.
5. Processing occupations.
6. Machine trade occupations.
7. Bench work occupations.
8. Structural work occupations.
9. Miscellaneous occupations.

Essentially, the categorical system used by the DOT represents a nominal scale. For the purposes of the present study, however, an assumption was made that the categories are ordinal with regard to worker traits. From that point the data were treated as interval in nature, the assumptions being that distances between each category are relatively equal.

Insert Tables 15 and 16 about here

The Kuder Preference Record-Vocational (KPR-V) is the instrument alluded to in Table 16 above. The scoring of this instrument produces empirical data expressed in terms of percentile ranks which are based upon a set of standardized norms. Finally, the variable designated as a composite IQ score represents the average IQ scores for each subject over those group tests found in the sample (California Test of Mental Maturity, Henmon-Nelson, Kuhlman-Anderson, Lorge-Thorndike, Otis-Lennon, and Otis Alpha, Beta and Gamma).

Means, standard deviations and sample sizes for each AVTS feeder school in the sample on each of the one and eight card variables are available upon request from the researchers. Due to the inordinate amount of space that would be needed to present these data they are not included in this report.

Analyses Relative to the Three Research Questions

The first step undertaken at this stage was to investigate the relationship between the independent variables available from the seventh, eighth and ninth grade records (e.g., course grades, interest inventory scores, IQ scores, parent demographic data) and the dependent variable: average achievement in AVTS courses. This investigation is most closely related to question number three on Page two: Which independent variables available from the seventh, eighth, and ninth grade records result in predicting the dependent variable (achievement in particular courses) most effectively?

In the analyses which were undertaken, the sample consisted of subjects for whom the combination of one and eight card data existed (N = 3,027). As a result the Philadelphia Mastbaum sample was eliminated from this analysis as was noted earlier. Some subjects within the remaining twelve AVTS's were also eliminated when a one and eight card combination was not available for them.

Even with the reduction in sample size to conform to the restrictions stated above, there still remained random missing data points throughout the data cards of the remaining 3,027 subjects. At this stage it was decided to assign the missing data zeros. Table 17 presents the intercorrelation matrix for the variables found on the one and eight cards. Where there were missing data, zeros were assigned. Where course grades are correlated, the average grade per category (e.g., English or social studies) has been used.

Insert Table 17 about here

For the purpose of analysis, the total listing of AVTS course options (dependent variable-success in AVTS courses) were assigned to one of twenty-one groupings. The rationale for this decision was as follows: There are many different course options with similar titles and small numbers of subjects across all of the AVTS. In order to conduct an analysis with potential meaningfulness, the various course options were classified into twenty-one major groupings. The assumption behind these groupings was that there is a commonality in the training and on-the-job requirements for the options included within each major grouping category. Table 18 contains the groupings and the option assigned to each category.

Insert Table 18 about here

To determine the relationship between the independent variables (one and eight card data acquired from the seventh, eighth, and ninth grade records) and the dependent variable (AVTS grade average in one of the twenty-one course option groupings), regression analysis was undertaken. In order to minimize the error when analyzing any number of groups, "dummy" criterion variables, one fewer than the number of groups, are used (Tatsuoka, 1971). Using the grade value assignments as an example, the following procedure takes place. In this example K = 5 groups are under study. To carry out the analysis, K - 1 = 4, dummy criterion variables Y_1, Y_2, Y_3, Y_4 are used, and scores on these are assigned in the following manner:

	Y_1	Y_2	Y_3	Y_4
All group 1 members get	1	0	0	0
All group 2 members get	0	1	0	0
All group 3 members get	0	0	1	0
All group 4 members get	0	0	0	1
All group 5 members get	0	0	0	0

As Tatsuoka points out: "Canonical correlation analysis is a technique by which we determine a linear combination of p predictors on the one hand, and a linear combination of q (= K - 1 in the present context) criterion variables on the other, such that the correlation between these linear combinations in the total sample is as large as possible" (1971, p. 178).

The first set of dummy variables generated for these analyses involved the arbitrarily assigned set of twenty-one AVTS course option groupings described on page 15. Following the procedure described above (Tatsuoka, 1971), twenty dummy criterion variates were generated.

For the corresponding step in this analysis, a second set of dummy variates was generated for the twelve AVTS's. Following the procedure from Tatsuoka (1971) described above, K - 1 dummy variates (12 - 1 = 11) were generated.

As there were at least twenty predictor variables in addition to the generated dummy variates for this analysis, a step-up multiple regression analysis procedure was used. This procedure allows for a systematic guided trial-and-error process in which predictors are added one at a time to the linear equation provided the addition produces a statistically significant increase in the multiple-R (Tatsuoka, 1969).

Predictor variables for this analysis included the thirty-one dummy variates generated from the AVTS course option groupings (21 - 1 = 20) and the number of sample AVTS's in the analysis (12 - 1 = 11). In addition, there was twenty variables from the one and eight card data. Table 19 provides a summary of the analysis. It should be noted here that the Kuder Preference Record-Vocational (KPR-V) score variables were not included because of the high incidence of missing data across the sample and the low correlations between AVTS grades and KPR-V scores. Table 17 reveals that the highest correlation between AVTS grades and KPR-V was .03.

Insert Table 19 about here

In summary, the analysis represented in Table 19 and discussed above produced a multiple correlation coefficient of .46 and accounted for 21 per cent of the total explained variance. Those predictor variables which contributed the greatest portion of the multiple regression correlation were the dummy variates, junior high science grades, junior high home economics or industrial arts grades, and persistence. Together, these four variates generated a multiple correlation coefficient of .42 and accounted for 17 per cent of the total explained variance.

At this point, the researchers request that the reader view these data with considerable caution. The reason for this warning lies in the potentially serious bias resulting from the missing data throughout the sample.

The second step taken was to investigate the linear relationship between the junior high school predictor variables and the dependent variable, AVTS course option grades. This analysis is an attempt to operationalize question number two on page 1: To what degree can students achieving at particular levels in particular AVTS courses be differentiated on the basis of the data available on them in the seventh, eighth and ninth grade records?

A canonical analysis, as described on page 17, was conducted in order to identify the components of the predictor variables which are most highly related linearly to the AVTS course options and grades. The essential question addressed is: "What sort of junior high school record profile tends to be associated with what sort of pattern of course selection and of academic achievement in high school AVTS courses?" (Tatsuoka, 1971).

Two kinds of significance tests are of interest in canonical correlation analysis. The first is an overall test to decide whether there is any significant relationship between the two sets of variables; the predictor variables and course options and grades. In this test of the hypothesis of no association between the two sets of variables, the F test yielded a value of 7.34 (d.f. = 400 and 42,438.11, $p < 0.001$) indicating a significant relationship between the two sets of variables (predictor and criterion).

Since overall significance was found, the next step was to find out how many canonical-variate pairs are significant. Table 20 summarizes the canonical-variate pairs which were significant at the .05 level for curricula and grades. For the AVTS courses there were three significant canoncial variate pairs while the AVTS course grades yielded two significant pairs.

Insert Table 20 about here

In the case of the AVTS course options, a linear relationship does exist for set 1 through 20, set 2 through 20 after the effects of set 1 through 20 have been removed and set 3 through 20 after the effects of sets 1 through 20 and 2 through 20 have been removed. In regard to the AVTS course grades, a linear relationship does exist for set 1 through 4 and set 2 through 4 after the effects of set 1 through 4 have been removed.

Table 21 and 22 present the weighted linear combinations for each of these sets. The raw score values represent the contribution of this variable to the function. Those functions which have been designated above are not correlated together and thus provide maximum possible correlation of all linear combinations. Briefly, one would take the raw score for a predictor variable (e.g., English grade-point-average), multiply it by the raw weight and sum for prediction:

$$X_E \ (-0.0.) + X_E \ (-0.06)$$

where X_E = English grade-point-average
-0.01 = Raw weight for English grade, Set 1-4 Table 22
-0.06 = Raw weight for English grade, Set 2-4 Table 22

Insert Tables 21 and 22 about here

The data provided in Table 21 allowed the researchers to compute the probability of each subject in the sample occupying the AVTS curriculum group which would have been predicted most appropriate for him had the canonical analysis described above been performed.

The data in Table 23 indicate that out of 3,027 possible hits, 336 subjects were classified into the AVTS course option category in which they actually studied during their AVTS experience. This provides a hit ratio of 11 per cent when using the independent canonical-variate classifications and knowledge of the subject's actual real choice of course grouping while attending the AVTS.

Insert Table 23 about here

Assuming that the data and analysis were worthwhile, one might wonder why the hit rate was so low. Such results imply that a high percentage of the subjects are studying in a field other than that for which they seem to be most suited according to this data analysis.

As to the immediate implications for counseling which this information provides, the researchers offer the following thoughts to be considered. Counselors and other decision-making personnel in the AVTS system should ask themselves whether the quota system may be responsible for some portion of this result. "Quota system" means the arbitrary designation of enrollment limits established for feeder high schools within each AVTS course option. Such being the case, students are "counseled" into, and out-of, certain course groupings in order to facilitate administrative needs for minimum and maximum enrollments. For example, the question can be posed in a more operational format as: How many students are preparing for a career in electronics who preferred to study auto mechanics, but were unable to do so because the entrance quota in the auto mechanic curriculum was filled for their school?

A second area of concern evolves from the work of persons such as Holland (1959). Briefly, Holland states that, in order for one to make adequate occupational choices, there is a need for more accurate self-knowledge and for more accurate information about occupational environments prior to decision-making.

If one assumes that there are misplaced subjects resulting from free choices rather than the quota system, Holland's position may offer implications for school personnel. Perhaps the early adolescents who must make their choice prior to the tenth grade need more access to accurate information about such factors as their own abilities and interests as well as more accurate information about the career potential of the various AVTS course offerings. In addition, these youths may also need more and better professional help in their attempt to make sense out of such information. This question, posed in a more operational way, is: How many junior high school students choose their AVTS course option in a cursory manner with little or no meaningful usage of information and professional counseling services. Additionally, how aware is the professional staff of the social pressures and childhood related fantasies which may be influencing the student's curriculum decision?

Before moving ahead to the next analysis, the researchers wish to emphasize their feeling that the preceeding analyses may have been seriously biased by the substitution of zeros for missing data. Because of this possibility, the researchers turned to a procedure known as the random missing data option for the remaining analyses.

The missing data condition developed because data were not available on some of the variables for some of the observational units. As stated above, in the previous analyses the missing data were assigned zeros resulting in a possible serious biasing of the reported results. The random missing data option assumes that data were missing because of phenomenon completely unrelated to the study (e.g., unreadable data, misplaced data).

When it is decided that the missing data are "random missing data," means and standard deviations are computed independently for each variable (Verity and Kautz, 1972). In calculating correlations where missing data exist, these means are used, and the cross product term is based upon paired observations. The formula used for the correlation coefficient with random missing data is:

$$\text{Corr. Coeff.: } r(X,Y) = \frac{\sum_{K=1}^{n^1} \left[X^1(K)\,Y^1(K)\right] - n^1\,\bar{X}^1\,\bar{Y}^1 + \left\{(\bar{X} - \bar{X}^1)\,(\bar{Y} - \bar{Y}^1)\right\}}{\text{SQRT}\left[\text{SUM}\,(X - \bar{X})^2\ \ \text{SUM}\,(Y - \bar{Y})^2\right]}$$

where:

n^1 = the number of $X^1\,Y^1$ observations.

X^1 and Y^1 = values of the variables only when both are present for a given observation.

$\bar{X}^1 = \frac{\text{SUM}\,X^1}{n}$

$\bar{Y}^1 = \frac{\text{SUM}\,Y^1}{n}$

$\bar{X} = \frac{\text{SUM}\,X}{n}$

$\bar{Y} = \frac{\text{SUM}\,Y}{n}$

X and Y = the pairs of variables in each observational unit where no missing data exist

n = the number of observations.

In the formula above, the last term in the numerator (enclosed in the braces) corrects the discrepancy between the means. For a more complete discussion of the use of these equations for random missing data, see Games (1967).

The first analysis undertaken with the random missing data option in use was a multiple step-up regression analysis of twenty-nine predictor variables found on the one and eight cards with the grade average achieved in AVTS courses serving as the criterion. In this analysis question three from page 2 was again the focus of attention. Table 24 identifies the predictor and criterion variables and presents an intercorrelation matrix for them

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Insert Table 24 about here

In this analysis twenty-six of the twenty-nine predictor variables provided a multiple correlation coefficient of .64, accounting for 41 per cent of the explained variance. The F ratio of 1.67 (27 and 655 dF) was not significant at the .01 level for the step-up to variable twenty-seven. In the previous step, the F ratio was significant at the .01 level (1.73, dF 26 and 656). For the significance test an average n of 683 was used which is allowable under the random missing data option of the "Pearson Product Moment Coefficient (PPMCR)" program used in this analysis (Verity and Kautz, 1972). Table 25 summarizes the results of this multiple regression analysis.

Although the researchers considered the results of this analysis to be more promising than those generated by the analyses using zeros for missing data, these data as presented provide a rather cumbersome equation. Should the decision-makers decide to use these data as the basis for a state-wide common prediction formula, data would be necessary which would allow the users of the equations to determine what combination of predictors they wish to use (e.g., science grades, Scientific Interest on Kuder, business education grades, and Mechanical Interest on Kuder). Upon determining which set of predictors would be used, one would need access to the appropriate weights for the chosen predictors at that step. Using the above case as an example one would compute a predicted AVTS grade from the students' junior high school data:

$$Y^1 = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4$$

where:

Y^1 = predicted AVTS grade average

a = the constant (intercept)

X_1 = junior high science grade average

X_2 = Kuder Scientific Interest score

X_3 = junior high business education grade average

X_4 = Kuder Mechanical Interest score

b_1 = weight for X_1

b_2 = weight for X_2

b_3 = weight for X_3

b_4 = weight for X_4

The multiple regression coefficient for this step is .44.

In order to compute equations similar to the sample above, one would need access to a computer as conversions are necessary where missing data exists. In addition, one wonders how many junior high school students in Pennsylvania have business education grades, Kuder Scientific, and Kuder Mechanical sco~es. For the sample used in this study, the analysis has substituted the missing data option in numerous instances. Should the decision-makers desire to compute these equations, the necessary data are available from the researchers upon authorized request. Publication of all these weights in this report would be unduly cumbersome.

Insert Table 25 about here

The second step in the analyses using the random missing data option also concerned itself with question number three on page 2. However, the researchers restricted themselves to ten of the one and eight card predictor variables which least often were missing data points across the AVTS sample in this investigation. Again, the criterion, was AVTS grade average. The ten predictor variables chosen were sex, English grade, social studies grade, math grade, science grade, art grade, verbal music grade, home economics or industrial arts grade, gym grade and father's occupation.

Thus, the majority of these predictor variables which were most often found across this sample are course grades earned in the subjects more commonly attended by junior high school students. Attempts to use standardized test results and demographic information in an investigation of this nature, wherein the researchers are dependent upon existing data, were frustrated because of the lack of uniformity in standardized testing programs or possibly because of insufficient record keeping systems by the schools. It appears to the researchers that this condition is evidence in favor of more uniform standardized testing programs if one wishes to use such information as data applicable to generic, state-wide or area-wide regression and discriminant "bridges." Table 26 presents a summary of the multiple step-up regression analysis alluded to above. In this analysis the ten specified predictor variables were investigated relative to their relationship to AVTS grade-point-averages in each of the twelve sample AVTS's. Those variables not entered in the table are the ones which individually contributed less than one per cent of the explained variance.

Insert Table 26 about here

Table 27 provides information relative to the necessary equations which would be used should the decision-makers wish to use distinct prediction formulas for each of the twelve sample schools. Although the data for the necessary equations is available in Table 27, not all of the variables can be entered as raw data. All variables except sex must be entered in standardized form. Standardization procedures were necessary in order to remove school differences in the data. Should it be decided that these formulas are to be used, the procedures for conversion of raw data to standardized data are available from the researchers.

Insert Table 27 about here

Due to the aforementioned data collection and conversion problems, one can not use the data in Table 27 in a paper and pencil fashion. One will have to have access to a computer which, in turn, can perform the random missing data option where subjects are missing data necessary to an equation; convert the raw data to the proper standardized data format; and, compute the resultant data according to a linear multiple regression formula. For example, a sample of such a formula for York AVTS data would be as follows:

$Y = 0.00 \quad 0.22\ (X_1) \quad 0.12\ (X_2)$

where:

Y = predicted AVTS grade

X_1 = Home economics or industrial arts grade in junior high school (converted).

X_2 = Social studies grade in junior high school (converted).

The data from the foregoing analysis also provided the researchers with information relative to question one on page 1: Are the characteristics of students who achieve at various levels in specific courses constant across AVTS's? Upon viewing Table 26, the reader will note that the multiple correlation coefficients (range - .29 to .64) and the predictors vary. Table 28 presents a summary of the final multiple correlation coefficients (R) for each of the twelve sample schools with all ten independent predictor variables entered. These findings are presented in order to offer data relative to the research question cited earlier in this paragraph.

Insert Table 28 about here

It is evident from the data presented in Table 28 that predictors significantly related to constant curricula across AVTS's vary in influence. Thus, one can infer that the content of common curricula or evaluative criteria from which course grades result are less than standardized from AVTS to AVTS across the Commonwealth. Such being the case, the researchers question the use of data generated by these analyses into any common set of predictors for a state-wide selection and counseling program. Rather, AVTS's are sufficiently different in course content and/or grading criteria to require individual prediction equations.

Conclusions

The nature of this investigation and the available data has caused the researchers to seek results in a less systematic fashion than was originally expected. Accordingly, the research reporting has been an attempt to organize the data analyses around the three major questions posed in the research proposal. At times, the researchers have paused during the preceding data presentations to reflect upon thoughts relative to the particular analyses. At this point, the researchers wish to conclude the research report with a more comprehensive statement of their recommendations flowing from the foregoing research data and preceding review of the related professional literature.

Standardization of Data

Cumulative records for over 4,000 students who attended the thirteen sample AVTS's were collected by the researchers. It soon became evident during this collection process that numerous different standardized testing programs exist across the state of Pennsylvania and within the groups of feeder schools that send students to each of the AVTS's. The result of this condition, relative to an investigation of this nature, is that numerous subjects within the sample had non-comparable predictive data available about them. In addition, massive missing data points existed throughout the sample in cases were no information was available for a sample subject in a particular category (i.e. for some subjects there were no known IQ scores). However, for other subjects IQ scores were available.

Related research found in the professional literature reveals that in other previous studies the researchers involved were using independent variables which were common to all subjects. This condition implies that the subjects had either been involved in some kind of standardized evaluation program, or else the researchers had imposed their own preselected instruments upon a selected set of subjects. In either case, data acquired on a standardized instrument across all subjects is comparable and missing data points were nonexistent or significantly reduced. Since this study, in effect, tried to use what was already available rather than introduce new predictors, a very different condition ensued.

The only independent variables found to be common across all subjects in this AVTS sample were the subject matter grades achieved in junior high school courses. However, a close investigation of grading systems reveals that they are, in truth, only standardized superficially. Teachers, and others who determine the student grades, may use a standardized form of recording grades (i.e. A, B, C, D, F), but use various criteria for arriving at the grades. For example, is an "A" awarded by Mrs. Smith in English at school X in the Columbia-Montour AVTS district equivalent to an "A" awarded by Mr. Jones in English at school Y in the Parkway West AVTS district? From the experiences comprising this study, it is very doubtful. Standardization of school grades across the state seems to be, at present, a task beyond the reach of AVTS decision-makers.

If one carries this argument a step further, it becomes evident that the dependent variables in this research (AVTS course grades) also lack standardization. Grading in the AVTS's is subject to all of the shortcomings relative to standardization which were discussed in the previous paragraph.

As noted several times, the results of this investigation may have been biased by the researcher's attempts to rectify the missing data problem in the analyses. In addition, subjects originally chosen by the sampling procedures described earlier were, at times, eliminated when data were missing. Subjects from some AVTS feeder schools and one entire AVTS were eliminated en masse because of missing data. This elimination of block of subjects may also have biased the results of the analyses.

Record Keeping

Considerable time and effort was expended by the researchers in an effort to acquire the necessary and appropriate data for this investigation. While the majority of the schools and their personnel were cooperative, the researchers found the data collection, assemblage, and codification to be very frustrating. This frustration emanated principally from the great variety of record keeping systems used by the schools. However, the frustration also evolved from difficulties related to the cumbersomeness involved in record retrieval at the schools and the associated time delays.

Apparently, as is the case in many institutions, the records are kept in such a fashion that only certain persons at the institution can locate and decipher them. In addition, updating and organizing the information is a low-priority task on a list of tasks too large for the personnel of the institution to accomplish. The result of this condition is that the data on the permanent records of subjects in the AVTS and their feeder schools is, in general, not readily available for retrieval as is necessary in research projects. In addition, should it be decided to incorporate some of the results of this investigation, the researchers believe that many school counselors will find the collection of necessary preliminary data to be a cumbersome task merely because of the problem of accessability.

In the opinion of these researchers, the record keeping systems in the schools need to be vitalized. In addition, updating and organization of these records is in need of a higher priority if the accumulated data are to be used for research and the formulation of specific selection and counseling models. From the researchers' point-of-view standardized procedures of record keeping across the state are preferable. However, in the light of the known attitude of local governing units (e.g., boards of education) toward central controls, such uniformity in record keeping appears to be no easily solved problem.

Use of Findings

Results of this investigation have been presented earlier in the text of this report. In general, two statistical procedures were used to deal with the problem of missing data: substitution of zeros and the random missing data option. In both cases there is a possibility of statistical bias. However, of the two methods, that which is most preferred by the researchers at this time is the random missing data option.

The findings across AVTS and the associated data collection problems cause the researchers to question the advisability of using the accompanying research data for state-wide selection models. It appears more appropriate to develop specific selection models for each AVTS independently of the others.

If the decision-makers decide to consider the use of the findings for each of the AVTS's found in the sample, it will be necessary to have access to a computer and computer programmers who can translate the findings into a plan which local school personnel can use. The feasibility of this plan is, of course, associated with the accessability of data available in local records which was alluded to in the previous section.

Finally, if these results are to be considered for use in the AVTS system, consideration must be given to the question of cross-validation. Procedures for cross-validation could either be undertaken by the school systems in question or else by independent researchers with the cooperation of the participating schools.

Further Research

Because of time and budget limitations, the researchers did not exhaust all of the investigative potential of the accumulated data. At present, these data are stored in card and tape form and are accessible to the researchers and any other persons duly authorized to use them. Although the range of research questions is open to the creativity of interested parties, the researchers offer the following suggestions for consideration:

1. Analyze the data available for the Philadelphia Mastbaum AVTS.
2. Using selected predictors similar to those investigated already analyze the relationship between those predictors and AVTS grade averages in each of the twenty-one course option groupings or any other set of groups arbitrarily determined to be on interest.

It is clear to the researchers that this study is a beginning rather than an ending. The AVTS feeder school linkages are complex and they need to be studied in depth. The current data and findings are baseline, and the challenge is an open one.

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Table 1

Specific Variables Assigned to Each of the Eight Data Cards

Card Number	Variable Name	Sub Variable Name (If any)
1	Identification of AVTS Course Option	
	Persister or Dropout	
	AVTS Grades	Grade 10
		Grade 11
		Grade 12
	Junior High School Grades	Grade Levels
	English	Grades 7 through 9
	Social Studies	Specific title
		Grades 7 through 9
	Math	Specific title
		Grades 7 through 9
	Science	Grades 7 through 9
	Foreign Language	Specific title
		Grades 7 through 9
	Art	Grades 7 through 9
	Vocal Music	Grades 7 through 9
	Instrumental Music	Grades 7 through 9
	Home Economics	Grades 7 through 9
	Business Education	Specific title
		Grades 7 through 9
	Industrial Arts	Specific title
		Grades 7 through 9
	Physical Education	Grades 7 through 9
	Special Education	Grades 7 through 9
2	Stanford Achievement Test	Paragraph Meaning
		Word Meaning
		Spelling
		Language
		Arithmetic Con.
		Arithmetic Comp.
		Arithmetic App.
		Science
		Social Science
	Metropolitan Achievement Test	Word Knowledge
		Word Ds. Reading
		Spelling
		Language
		Lang. Stud. Skills
		Arithmetic Comp.
		Arithmetic Pro.
		Social Studies Info.
		Social Studies Skills
		Science
	SRA - National Educational Development Test	English Usage
		Math Usage
		Social Studies Reading
		Natural Science Reading
		Word Usage
		Composite

Table 1 (Cont'd)

3	Sequential Tests of Educational Progress (STEP)	Math Science Social Studies Reading Listening Writing
	California Achievement Test	Reading Vocabulary Reading Comp. Arithmetic Reasoning Arithmetic Fundamentals Mech. of Eng. Spelling Language Grade Placement Battery Grade Placement
	California Reading Achievement Test	Total
4	Iowa Test of Basic Skills	English History Math (Arithmetic) Reading Vocabulary Language Arts Work Study Composite Spelling Capitalization Punctuation Usage Total Language Maps Graphs References Total Work Study Concepts Problems Total Arithmetic
5	Differential Aptitudes Test	Verbal Reasoning Numerical Ability Verbal Reasoning + Numer. Ability Abstract Reasoning Clerical Speed and Accuracy Mechanical Reasoning Space Relations Spelling Grammar

Table 1 (Cont'd)

5	SRA Scholastic High School Placement Test	Verbal Quantitative Total Ability Reading Arithmetic Language Option Composite Scientific Method
	Tests of Academic Promise	Abstract Reasoning Numerical Abstract Reasoning + Numerical Verbal Language Usage Verbal + Language Usage
6	School and College Ability Test	Verbal Quantitative Total
	Iowa Algebra Test	Total
	Reading Diagnostic Test	Words Per Minute Vocabulary Comprehension Total
	SRA Reading Record	Rate Comprehension Skills Vocabulary Total
	Nelson-Denny Reading Test	Vocabulary Comprehension Rate
7	Gates Reading Test	Speed Comprehension Average
	Gates Reading Survey	Speed Vocabulary Comprehension Accuracy
8	Father's Occupation Father Living or Deceased Mother's Occupation Mother Living or Deceased Number of Parents Working	

Table 1 (Cont'd)

8	Kuder Preference Record	Mechanical Computational Scientific Persuasive Artistic Literary Musical Social Science Clerical Outdoor
	Intelligence Tests	Grades 7 through 9

Table 2

Number of Students for Whom Data were Acquired on Each of the Eight Data Cards - Columbia-Montour

Feeder School ID	Card Number 1	2	3	4	5	6	7	8
01	8	4	8	0	1	8	0	8
02	53	6	0	1	2	3	1	53
03	24	4	0	0	18	0	0	23
04	14	0	0	12	14	12	0	14
05	37	6	0	0	31	0	0	37
06	24	22	0	0	22	19	16	24
Totals	160	42	8	13	88	42	17	159

Table 3

Number of Students for Whom Data were Acquired on Each of the Eight Data Cards - North Montgomery

Feeder School ID	Card Number 1	2	3	4	5	6	7	8
01	11	10	0	0	0	0	0	11
02	42	3	0	0	28	0	0	42
03	142	0	0	113	118	0	142	142
04	30	20	0	0	12	0	0	30
05	77	66	56	0	64	0	0	76
06	48	2	1	0	1	0	48	48
Totals	350	101	57	113	223	0	190	349

Table 4

Number of Students for Whom Data were Acquired on Each of the Eight Data Cards - Philadelphia Mastbaum*

Card Number 1	2	3	4	5	6	7	8
689	0	0	360	453	0	0	1

*Students attend this school full time. As a result there are no feeder schools.

Table 5

Number of Students for Whom Data were Acquired on Each of the Eight Data Cards - York*

	Card Number							
	1	2	3	4	5	6	7	8
	502	1	4	0	28	12	0	442

*Students attend this school full time. As a result, there are no feeder schools.

Table 6

Number of Students for Whom Data were Acquired on Each of the Eight Data Cards - West Side

Feeder School ID	Card Number 1	2	3	4	5	6	7	8
01	23	3	0	0	12	0	0	23
02	21	1	0	0	0	0	0	21
03	1	0	1	0	0	0	0	1
04	3	2	0	0	0	0	0	3
05	1	0	0	0	0	0	0	1
06	103	6	0	1	1	1	0	103
07	20	14	0	0	0	0	0	20
08	8	0	0	0	0	0	0	8
09	70	16	0	0	1	0	0	67
Totals	250	42	1	1	14	1	0	247

Table 7

Number of Students for Whom Data were Acquired on Each of the Eight Data Cards - Lenape

Feeder School ID	Card Number 1	2	3	4	5	6	7	8
01	12	0	0	0	0	0	0	11
02	10	0	0	0	0	0	0	10
03	9	3	0	0	9	0	0	9
04	18	0	0	0	18	0	0	18
05	32	0	0	0	30	0	0	32
06	17	16	0	0	15	0	0	17
07	47	7	0	34	35	0	0	46
08	9	0	0	0	0	0	0	9
09	14	0	0	0	12	0	0	14
10	10	0	0	0	0	0	0	10
Totals	178	26	0	34	119	0	0	176

Table 8

Number of Students for Whom Data were Acquired on Each of the Eight Data Cards - Centre

Feeder School ID	Card Number 1	2	3	4	5	6	7	8
01	72	0	70	0	66	0	0	70
02	72	0	71	0	62	0	0	0
03	27	0	22	0	21	0	0	1
04	37	0	0	0	0	0	0	37
Totals	208	0	163	0	149	0	0	108

Table 9

Number of Students for Whom Data were Acquired on Each of the Eight Data Cards - Delaware No. 1

Feeder School ID	Card Number 1	2	3	4	5	6	7	8
01	43	0	0	32	33	0	32	43
02	6	2	0	0	0	0	0	6
03	11	0	0	0	0	0	0	11
04	23	0	0	0	0	19	1	1
05	30	0	0	0	30	0	0	30
06	74	0	0	0	0	0	0	74
07	21	0	0	0	5	0	0	21
08	21	0	0	0	11	0	0	6
09	11	9	0	0	0	0	0	9
10	4	0	0	0	0	0	0	3
11	22	8	0	0	8	0	0	21
12	17	14	0	0	13	0	0	16
13	4	2	0	1	2	0	0	4
14	48	1	0	0	33	0	0	47
15	50	1	0	35	2	1	0	48
16	31	18	0	0	20	1	0	31
17	13	0	0	0	0	0	0	13
18	27	14	0	0	9	0	0	26
19	26	24	0	0	26	0	0	25
20	21	0	0	0	15	0	0	21
Totals	503	93	0	68	207	21	33	456

Table 10

Number of Students for Whom Data were Acquired on Each of the Eight Data Cards - Juniata Mifflin

Feeder School ID	Card Number 1	2	3	4	5	6	7	8
01	36	18	0	14	33	0	0	34
02	64	36	18	0	0	0	0	63
03	31	0	26	0	25	0	0	20
04	6	0	0	5	4	0	0	2
05	40	0	15	0	0	0	0	29
Totals	177	54	59	19	62	0	0	148

Table 11

Number of Students for Whom Data were Acquired on Each of the Eight Data Cards - Reading Muhlenberg

Feeder School ID	Card Number 1	2	3	4	5	6	7	8
01	262	225	0	0	247	0	0	226
02	76	0	0	0	0	0	0	21
Totals	338	225	0	0	247	0	0	247

Table 12

Number of Students for Whom Data were Acquired on Each of the Eight Data Cards - Erie

Feeder School ID	Card Number 1	2	3	4	5	6	7	8
01	65	0	61	0	0	61	0	64
02	14	0	13	0	0	13	0	13
03	23	0	17	0	20	17	0	21
04	17	0	0	0	16	0	0	17
05	13	0	11	0	13	11	0	12
06	11	0	9	0	9	9	0	9
07	27	0	26	0	23	26	0	11
08	40	0	35	0	36	36	0	40
09	12	0	12	0	11	12	0	0
10	30	0	27	0	27	27	0	2
11	29	0	24	0	0	24	0	21
Totals	281	0	235	0	155	236	0	210

Table 13

Number of Students for Whom Data were Acquired on Each of the Eight Data Cards - Parkway West

Feeder School ID	Card Number 1	2	3	4	5	6	7	8
01	7	6	0	0	0	0	0	5
02	37	0	0	0	30	0	0	37
03	13	0	0	0	6	0	0	12
04	23	19	0	0	20	0	0	22
05	49	0	0	0	0	0	0	48
06	25	0	0	21	25	0	0	0
07	8	0	0	0	0	0	0	6
08	66	0	1	0	0	0	0	41
09	21	4	0	0	0	0	0	21
10	20	0	0	0	0	0	0	19
11	20	5	0	0	0	0	0	20
12	14	0	0	0	0	0	0	13
13	15	0	0	0	14	0	0	14
Totals	318	29	1	21	95	0	0	258

Table 14

Number of Students for Whom Data were Acquired on Each of the Eight Data Cards - Fayette

Feeder School ID	Card Number 1	2	3	4	5	6	7	8
01	36	14	0	36	0	0	0	36
02	29	24	0	0	1	0	0	28
03	26	0	25	0	0	0	0	26
04	19	2	0	14	0	0	0	15
05	26	0	0	0	0	0	0	17
06	68	0	0	0	0	0	0	43
07	83	0	0	0	0	51	0	82
Totals	287	40	25	50	1	51	0	247

Table 15

Variables Found on Data Card Number One

Name		Identification Code	Range
Student Sex		Sex	1=Male; 2=Female;
Persistence		Per.	1=Graduated; 2=Drop;
AVTS grades		Cri.	5=A, 4=B, 3=C, 2=D,
Junior High School grades in	English	Eng.	1=F
	Social Studies	SOS	"
	Mathematics	Math.	"
	Science	Sci.	"
	Foreign Language	Lang.	"
	Art	Art	"
	Vocal Music	V Mus.	"
	Instrumental Music	IMD	"
	Home Economics or Industrial Arts	HEC	"
	Business Education	BED	"
	Physical Education	Gym	"
	Special Education	SED	"

Table 16

Variables Found on Data Card Number Two

Name	Identification Code	Range
Father's Occupation	FOCC	1 - 9
Father Living or Deceased	FAT #	1=Living, 2=deceased
Mother's Occupation	MOCC	1 - 9
Mother Living or Deceased	MOT #	1=Living, 2=deceased
Number of Parents Working	Work	1 - 2
Kuder Mechanical	Mech	0 - 99
Computational	Comp.	"
Scientific	Scie.	"
Persuasive	Pers.	"
Artistic	Arts	"
Literary	Lite	"
Musical	Musi.	"
Social Service	Soci.	"
Clerical	Cler.	"
Outdoor	Outd	"
Composite IQ Score	IQ's	———

TABLE 17

Intercorrelation Matrix for the 1 and 8 card Variables - Zeros Use

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Sex	1.00																	
2. Persistence	.02	1.00																
3. Criterion	.11	-.14	1.00															
4. Eng. Grades	.28	-.02	.27	1.00														
5. Soc. Stud. "	.12	-.07	.28	.61	1.00													
6. Math "	.08	-.03	.28	.50	.47	1.00												
7. Science "	.05	-.05	.30	.55	.60	.52	1.00											
8. Language "	.12	-.01	.11	.24	.18	.19	.17	1.00										
9. Art "	.11	-.03	.18	.29	.27	.25	.29	.09	1.00									
10. Verbal Music "	.24	-.03	.22	.41	.39	.31	.36	.03	.30	1.00								
11. Inst. Music "	.01	.00	.02	.04	.05	.07	.05	.07	.05	.04	1.00							
12. HEC or IA "	.02	-.02	.25	.29	.30	.32	.37	.04	.30	.24	.03	1.00						
13. Bus. Ed. "	.0[illegible]	.00	.12	.19	.18	.17	.18	.05	.09	.14	.00	.15	1.00					
14. Gym "	-.07	-.04	.16	.17	.19	.20	.20	.19	.19	.15	.06	.23	.07	1.00				
15. Special Ed. "	-.00	.0[illegible]	-.02	.03	.03	.02	.02	.02	.03	.02	-.00	.03	.04	-.00	1.00			
16. FOCC	.01	.01	-.00	.02	.01	.00	-.01	.01	.00	.00	.01	.00	-.00	.00	.03	1.00		
17. Fat. #	-.00	-.01	-.02	-.00	.01	-.02	-.01	-.00	-.0[illegible]	-.01	.01	-.01	.01	.01	-.00	-.00	1.00	
18. MOCC	-.01	.01	-.02	-.02	-.03	.01	-.02	-.03	-.03	.00	.00	-.00	-.03	-.02	-.00	.04	-.04	1.0
19. Mot. #	-.00	.04	-.06	-.00	-.02	-.03	.00	.00	.00	.01	-.00	-.01	-.01	-.00	-.00	.02	.04	-.0
20. Work (Parents)	-.01	-.01	.01	-.02	.02	-.01	.02	-.01	.01	-.00	.02	.03	-.01	.02	-.00	.03	-.04	.02
21. Kuder Mech.	-.03	-.01	.03	-.02	.00	.01	.01	.01	.01	-.01	.00	.02	-.05	.02	-.00	.01	-.01	.03
22. " Comp.	.00	.00	-.01	.00	-.00	.06	.01	-.01	.02	-.00	.00	.04	.03	.01	-.00	-.00	.01	.01
23. " Sci.	-.02	.01	-.02	.03	.04	.02	.07	.03	.03	.04	-.01	.00	.01	.02	-.00	-.02	-.01	-.0
24. " Pers.	.04	.01	-.03	-.02	-.03	-.03	-.03	-.04	-.04	-.03	-.00	-.01	.04	-.01	-.00	.03	.01	.0
25. " Arts.	.02	.01	.03	-.00	-.02	-.01	-.00	.03	.03	.01	.01	.01	.00	.03	-.00	.01	.01	-.00
26. " Lit.	-.00	.02	-.02	.01	-.01	-.02	-.01	.01	.00	.01	.01	-.02	.01	-.01	-.00	.01	.01	-.04
27. " Musi.	-.00	.01	-.02	-.01	-.03	-.04	-.01	.00	.01	.00	-.02	-.02	-.02	.00	-.00	.01	-.01	.01
28. " Soci	.03	-.02	-.00	.03	-.00	-.01	-.01	.00	.00	.00	-.00	-.01	-.00	.01	-.00	.01	.01	.03
29. " Cler.	-.01	-.00	-.02	.02	.03	.04	.01	.00	.02	.03	-.00	-.00	.03	-.00	-.00	.00	-.01	-.02
30. " Out'D	-.01	.00	-.02	.03	-.01	-.01	-.02	.01	.00	-.01	.00	.03	-.00	.01	-.00	-.06	-.00	-.00
31. IQ's	.06	-.06	.14	.24	.26	.21	.27	.20	.14	.20	.02	.16	.14	.04	.00	-.01	.01	-.05

TABLE 17

and 8 card Variables - Zeros Used For Missing Data

8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
.00																							
.09	1.00																						
.03	.30	1.00																					
.07	.05	.04	1.00																				
.04	.30	.24	.03	1.00																			
.05	.09	.14	.00	.15	1.00																		
.19	.19	.15	.06	.23	.07	1.00																	
.02	.03	.02	-.00	.03	.04	-.00	1.00																
.01	.00	.00	.01	.00	-.00	.00	.03	1.00															
.00	-.00	-.01	.01	-.01	.01	.01	-.00	-.00	1.00														
.03	-.03	.00	.00	-.00	-.03	-.02	-.00	.04	-.04	1.00													
.00	.00	.01	-.00	-.01	-.01	-.00	-.00	.02	.04	-.00	1.00												
.01	.01	-.00	.02	.03	-.01	.02	-.00	.03	-.04	.02	-.04	1.00											
.01	.01	-.01	.00	.02	-.05	.02	-.00	.01	-.01	.03	-.00	.03	1.00										
01	.02	-.00	.00	.04	.03	.01	-.00	-.00	.01	.01	.01	-.02	-.16	1.00									
03	.03	.04	-.01	.00	.01	.02	-.00	-.02	-.01	-.02	-.00	-.01	.08	.03	1.00								
04	-.04	-.03	-.00	-.01	.04	-.01	-.00	.03	.01	.01	-.01	-.02	-.02	.06	-.28	1.00							
03	.03	.01	.01	.01	.00	.03	-.00	.01	.01	-.00	.00	.01	-.03	-.05	-.02	-.14	1.00						
01	.00	.01	.01	-.02	.01	-.01	-.00	.01	.01	-.04	-.00	.01	-.29	-.05	.01	-.12	.05	1.00					
00	.01	.00	-.02	-.02	-.02	.00	-.00	.01	-.01	.01	-.00	-.02	-.15	-.06	-.10	.14	.10	.13	1.00				
00	.00	.00	-.00	-.01	-.00	.01	-.00	.01	.01	.03	.00	.00	-.01	-.17	-.08	-.02	-.08	.03	.16	1.00			
00	.02	.00	-.00	-.00	.03	-.00	-.00	.00	-.01	-.02	-.00	-.01	-.18	.33	-.08	.14	-.29	.06	.08	-.26	1.00		
01	.00	-.01	.00	.03	-.00	.01	-.00	-.06	-.00	-.00	-.00	.00	.02	-.16	.01	-.08	.00	.04	.08	-.09	.07	1.00	
20	.14	.20	.02	.16	.14	.04	.00	-.01	.01	-.05	-.00	.06	.00	.01	.07	-.02	.01	.01	.00	.01	-.01	-.01	1.00

Table 18

Designations of Assignments of Specific AVTS Course Options
to Arbitrarily Designated Categories of Twenty-One Separate Groupings

Group Designations		
1	2	3
Air Conditioning Heating Heating, Refrigeration and Air Conditioning Plumbing and Pipefitting Plumbing, Pipefitting and Air Conditioning Plumbing and Heating	Air Craft Maintenance Appliance Repair Instrumentation Technology Mechanical Maintenance Music Musical Instrument Repair	Auto Body and Fender Auto Diesel Auto Mechanics Auto Speciality Automotive Service Automotive Technology Diesel Mechanics Station Mechanics
4	5	6
Building Construction Trades Building Trades Building Trades Maintenance Carpentry Construction Trades and Maintenance Masonry (Trowel Trades) Millwork and Cabinet-making Woodwork Occupation	Architectural Design Commercial Art Drafting Graphic Arts Mechanical Drawing Design Technology Printing and Publishing	Cosmetology
7	8	9
Custodial Services Materials Handling Warehousing	Dress Making Fabrics Power Sewing Slipcover and Drapery Tailoring Textile Products and Fabrics Upholstering	Audio-Visual Communication Technology Electricity Electrical Occupations Electrical Technology Electro-Mechanical Technology Electronics Technology Industrial Electricity Radio and TV
10	11	12
Fluid Power Heavy Equipment Operator Hydraulics	Foundry Metal Fabric Tech Sheet Metal Welding	Machine Shop Machine Tool Operation Mechanical Technology Metal Machine Operator Tool and Design Technology Tool and Die Design Technology

Table 18 (Cont'd)

13	14	15
Agriculture Agri-business Agricultural Technology Horticulture	Chemical Technology Environmental Technology Metallurgical Technology Plastic Technology Research Development Laboratory Technology	Civil Technology Engineering Related Technology

16	17	18
Interior Finishing Painting and Decorating	Photographic Technology Optician	Dental Assistant Dental Lab Technician Health Health Assistant Medical Assistant Medical Lab Assistant Research Lab Assistant

19	20	21
Accounting Advanced Office Average Business Grades Business Business Machine Operator Distributive Education (Merchandising) Marketing Scientific Data Processing Technology Technical Secretary	Apparel Design Child Development Clothing and Home Furnishing Food Preparation (Food Services) Home Economics Hospitality Services Nursery School Attendant	Driver's Education School Employment Cooperative Education

Tabie 19

Data Summary for Multiple Step-Up Regression
Anaylsis for 1 and 8 Card Data - Missing Data Assigned Zeros

Variable Name	dF 1	dF 2	F Value	Multiple R	Percent of the Variance Explained
Dummy Variables	31	2995	3.49	0.19	0.034
Sci.	32	2994	1.42	0.36	0.098
HEC	33	2993	1.68	0.39	0.024
Persistence	34	2992	1.85	0.42	0.017
Math	35	2991	1.95	0.43	0.013
Mus	36	2990	1.97	0.44	0.005
Gym	37	2989	1.97	0.44	0.005
MOT #	38	2988	1.96	0.45	0.003
SOS	39	2987	1.94	0.45	0.003
BED	40	2986	1.91	0.45	0.002
IQ's	41	2985	1.88	0.45	0.002
Sex	42	2984	1.85	0.45	0.002
Art	43	2983	1.81	0.45	0.001
SED	44	2982	1.77	0.46	0.000
Lang	45	2981	1.74	0.46	0.001
FAT #	46	2980	1.70	0.46	0.000
Eng	47	2979	1.67	0.46	0.000
FOCC	48	2978	1.64	0.46	0.000
Work	49	2977	1.60	0.46	0.000
MOCC	50	2976	1.57	0.46	0.000
IMD	51	2975	1.54	0.46	0.000

N=3027

Table 20

Step-wise Test of Statistical Significance for Discriminant Functions AVTS Course Options and Course Grades

Residual After Removing	Approximate Chi-square statistic	dF	P
A. AVTS Course Options (N=20)			
Set 1 through 20	2853.16	400	<0.0001
Set 2 through 20	683.75	361	<0.0001
Set 3 through 20	408.64	324	<0.0010
Set 4 through 20	323.27	289	<0.0808
Set 5 through 20	*242.29	256	<0.7217
B. AVTS Course Grades (N=4)			
Set 1 through 4	635.00	80	<0.0001
Set 2 through 4	234.79	57	<0.0001
Set 2 through 4	36.17	36	<0.4606
Set 4 through 4	11.93	17	<0.8045

*For the sake of parsimony, the remaining nonsignificant tests of significance were omitted.

Table 21

The Results of the Canonical-Discriminant Analysis for AVTS Courses*

Canonical Correlations

	Set 1 - 20 Value of the Canonical Correlation = 0.72		Set 2 - 20 Value of the Canonical Correlation = 0.30		Set 3 - 20 Value of the Canonical Correlation = 0.17	
	Weights for the Independent Variables					
Course Option Category	Raw	Standard	Raw	Standard	Raw	Standard
1	1.92	0.94	0.32	0.16	0.28	0.14
2	0.00	0.00	-0.10	-0.08	-0.28	-0.23
3	0.10	0.10	-0.05	-0.05	0.05	0.05
4	0.02	0.02	-0.13	-0.12	-0.12	-0.12
5	-0.04	-0.04	-0.20	-0.19	0.32	0.32
6	-0.05	-0.05	-0.46	-0.44	-0.32	-0.31
7	0.01	0.01	0.13	0.07	-0.35	-0.18
8	-0.00	-0.00	-0.20	-0.18	-0.36	-0.32
9	0.11	0.09	-0.17	-0.15	-0.21	-0.19
10	0.04	0.01	0.13	0.02	1.23	0.21
11	-0.09	-0.08	-0.01	-0.01	0.42	0.38
12	0.06	0.03	0.02	0.01	0.63	0.27
13	-0.06	-0.05	0.05	0.04	0.25	0.23
14	-0.06	-0.00	-0.94	-0.02	-31.72	-0.58
15	-0.01	-0.01	0.07	0.05	-0.15	-0.11
16	-0.01	-0.01	0.18	0.13	-0.21	-0.15
17	0.01	0.00	0.10	0.03	-0.65	-0.21
18	0.04	0.02	-0.11	-0.06	0.07	0.04
19	0.02	0.01	-0.11	-0.07	0.21	0.14
**20	-0.01	-0.01	-0.45	-0.36	0.18	0.15

*Course option categories identified in Table 18
**Course option 21 deleted (lack of subjects).

Table 22

The Results of the Canonical-Discriminant Analysis for AVTS Grades

	Canonical Correlations			
	Set 1 - 4 Value of the Canonical Correlation = 0.35		Set 2 - 4 Value of the Canonical Correlation = 0.25	
	Weights for the Independent Variables			
Variable Description	Raw	Standard	Raw	Standard
Persistence	0.65	0.32	-0.12	-0.06
Criterion	-0.31	-0.26	-0.99	-0.81
Eng.	-0.01	-0.01	-0.06	-0.06
SOS	0.11	0.11	-0.07	-0.07
Math	0.15	0.14	-0.22	-0.22
Sci.	0.34	0.33	-0.14	-0.13
Lang.	0.14	0.07	-0.21	-0.11
Art	0.08	0.08	-0.10	-0.09
V Mus.	0.13	0.12	0.17	0.15
IMD	-0.01	-0.00	-0.06	-0.01
HEC	0.30	0.27	0.04	0.03
BED	0.24	0.10	-0.12	-0.05
Gym	0.18	0.17	0.12	0.11
SED	-7.12	-0.13	-20.14	-0.36
FOCC	-0.00	-0.00	0.14	0.11
FAT #	-0.06	-0.04	0.11	0.08
MOCC	0.05	0.02	0.16	0.05
MOT #	-0.25	-0.14	0.16	0.09
Work	0.03	0.01	0.03	0.02
IQ	0.03	0.02	-0.02	-0.02

Table 23

Hits and Misses for the Probability of AVTS Sample Subjects Being Presently in that AVTS Curricular Group Which They are Most Like According to the Independent Canonical Variates Classification

AVTS Course Option Categories	Classification Group Hits	Classification Group Misses	Group Totals
1	1	78	79
2	14	33	47
3	9	348	357
4	3	269	272
5	9	274	283
6	78	150	228
7	2	20	22
8	0	62	62
9	58	264	322
10	2	6	8
11	50	95	145
12	23	275	298
13	0	70	70
14	0	57	57
15	1	0	1
16	1	12	13
17	1	11	12
18	53	63	116
19	6	488	494
20	25	115	140
21	0	1	1
Totals	336	2,691	3,027

TABLE 24

Intercorrelation Matrix For the 1 and 8 Card Variab the

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13		7
1. Sex.	1.00														
2. Persist.	.03	1.00													
3. Criterion	.12	-.18	1.00												
4. Eng. grade	.29	-.04	.28	1.00											
5. Sost. "	.12	-.01	.29	.61	1.00										
6. Math "	.08	-.04	.28	.51	.47	1.00									0
7. Scie "	.06	-.07	.31	.56	.61	.53	1.00								3 1.0
8. Lang. "	.24	-.05	.21	.46	.33	.36	.32	1.00							6 .3
9. Art "	.12	-.05	.20	.31	.29	.28	.31	.19	1.00						3 .31
10. V.Mus. "	.26	-.05	.25	.45	.43	.35	.40	.25	.32	1.00					5 .40
11. Inst. Mus "	.08	.00	.15	.19	.28	.36	.26	.16	.23	.23	1.00				6 .26
12. HEC or IA "	.02	-.03	.27	.31	.33	.34	.40	.16	.33	.26	.18	1.00			4 .40
13. BED "	.06	.01	.28	.44	.43	.40	.42	.32	.25	.41	.09	.36	1.00		0 .42
14. Gym "	-.08	-.05	.17	.18	.20	.21	.21	.11	.20	.17	.29	.26	.19	1.	.21
15. FOCC	.02	.02	-.01	.03	.01	.00	-.01	.00	.01	.00	.10	.01	-.01	.	0 -.01
16. Fat. #	-.00	-.02	-.03	-.00	.01	-.02	-.01	-.01	-.00	-.02	.08	-.02	.05	.0	2 -.01
17. MOCC	-.02	.05	-.05	-.06	-.10	.03	-.05	-.07	-.11	.01	.01	-.01	-.15	-.0	3 -.05
18. Mot. #	-.00	.08	-.12	-.01	-.04	-.05	.00	-.01	.02	.03	-.01	-.02	-.02	-.0	5 .00
19. Work	-.02	-.02	.02	-.03	.03	-.01	.03	-.02	-.01	-.01	-.19	.04	-.04	.0	1 .03
20. Kuder Mech.	-.15	-.04	.11	-.09	.01	.03	.04	-.17	.04	-.08	.15	.08	-.40	.0	3 .04
21. " Comp.	.01	.02	.06	.00	-.00	.24	.03	.08	-.08	-.00	.06	.18	.23	.0	4 .03
22. " Scie.	-.11	.02	-.08	.11	.18	.10	.30	.12	.10	.21	-.54	.02	.11	.0	0 .30
23. " Pers.	.15	.02	-.11	-.06	-.14	-.10	-.14	-.19	-.15	-.12	-.05	-.05	.28	-.0	0 -.14
24. " Arts.	.09	.05	.11	-.01	-.06	-.03	-.01	-.02	.14	.05	.42	.05	.00	.1	3 -.0
25. " Lite.	-.03	.11	-.10	.04	-.04	-.11	-.02	-.04	-.00	.04	.24	-.09	.05	-.0	-.02
26. " Musi.	-.02	.08	-.08	-.04	-.16	-.16	-.02	-.08	.03	.02	-.79	-.09	-.20	.0	5 -.02
27. " Soci.	.12	-.11	-.01	.13	-.00	-.03	-.04	.12	.01	.01	-.01	.05	-.04	-.0	3 -.04
28. " Cler.	-.04	-.01	-.06	.08	.11	.16	.06	.22	-.07	.00	-.34	-.01	.21	-.0	.06
29. IQ	.07	-.08	.17	.28	.31	.25	.32	.14	.18	.25	.16	.20	.37	.0	.32

TABLE 24

the 1 and 8 Card Variables - Random Missing Data Option Used

	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
0																							
3	1.00																						
6	.32	1.00																					
8	.31	.19	1.00																				
5	.40	.25	.32	1.00																			
6	.26	.16	.23	.23	1.00																		
4	.40	.16	.33	.26	.18	1.00																	
0	.42	.32	.25	.41	.09	.36	1.00																
	.21	.11	.20	.17	.29	.26	.19	1.00															
0	-.01	.00	.01	.00	.10	.01	-.01	.01	1.00														
2	-.01	-.01	-.00	-.02	.08	-.02	.05	.02	-.00	1.00													
3	-.05	-.07	-.11	.01	.01	-.01	-.15	-.05	.11	-.11	1.00												
5	.00	-.01	.02	.03	-.01	-.02	-.02	-.00	-.05	.06	-.00	1.00											
1	.03	-.02	-.01	-.01	-.19	.04	-.04	.03	.05	-.06	.04	-.07	1.00										
3	.04	-.17	.04	-.08	.15	.08	-.40	.09	-.05	-.15	.25	-.00	.16	1.00									
4	.03	.08	-.08	-.00	.06	.18	.23	.04	-.01	.15	.13	.08	-.13	-.17	1.00								
0	.30	.12	.10	.21	-.54	.02	.11	.09	-.12	-.23	-.18	.00	-.05	.09	-.03	1.00							
0	-.14	-.19	-.15	-.12	-.05	-.05	.28	-.08	.21	.17	.13	-.17	-.17	-.03	.07	-.29	1.00						
3	-.01	-.02	.14	.05	.42	.05	.00	.11	.07	.11	-.06	-.00	.10	-.04	-.06	-.03	-.15	1.00					
	-.02	-.04	-.00	.04	.24	-.09	.05	-.04	.03	.15	-.32	.00	.07	-.30	-.05	.01	-.13	-.06	1.00				
6	-.02	-.08	.03	.02	-.79	-.09	-.20	.01	.08	-.01	.11	.00	-.14	-.16	-.07	-.11	.15	.10	.14	1.00			
3	-.04	.12	.01	.01	-.01	.05	-.04	-.06	.08	.12	.30	.08	.00	-.02	-.18	-.09	-.03	-.09	.04	-.16	1.00		
	.06	.22	-.07	.00	-.34	-.01	.21	-.00	.00	-.14	-.15	.00	-.08	-.19	.34	-.09	.15	-.30	.06	-.08	-.27	1.00	
5	.32	.14	.18	.25	.16	.20	.37	.05	-.02	.03	-.20	-.02	-.03	.02	.06	.29	-.09	.05	.05	.01	.06	-.02	1.00

Table 25

Data Summary for Multiple Step-Up Regression Analysis
on 1 and 8 Card Data - Random Missing Data Option

Variable Name	dF 1	dF 2	F Value	Multiple R	Per cent of the Variance Explained
Sci. Grade	1	681	7.21	0.31	0.096
Sci. Int.	2	680	4.96	0.36	0.031
BED	3	679	4.13	0.39	0.027
Mech. Int.	4	678	4.17	0.44	0.042
Pers. Int.	5	677	4.79	0.51	0.065
MOT #	6	676	4.52	0.54	0.026
Sex	7	675	4.30	0.55	0.022
Persistence	8	674	4.12	0.57	0.019
Mus. Int.	9	673	3.91	0.59	0.015
Work	10	672	3.68	0.60	0.011
Comp. Int.	11	671	3.49	0.60	0.009
IQ's	12	670	3.26	0.61	0.005
FOCC	13	669	3.07	0.61	0.006
Art	14	668	2.92	0.62	0.005
MOCC	15	667	2.78	0.62	0.005
Lit. Int.	16	666	2.68	0.63	0.007
FAT #	17	665	2.56	0.63	0.005
SOS	18	664	2.46	0.63	0.004
Lang.	19	663	2.35	0.64	0.003
V. Mus.	20	662	2.26	0.64	0.002
Art Int.	21	661	2.15	0.64	0.003
Eng.	22	660	2.05	0.64	0.000
Math	23	659	1.96	0.64	0.001
Gym	24	658	1.88	0.64	0.000
Soc. Int.	25	657	1.80	0.64	0.000
HEC	26	656	1.73	0.64	0.000
Cler. Int.	27	655	1.67	0.64	0.000
Total (at Step 26):				0.64	0.406

Table 26

Summary of the Multiple Step-Up Regression Analyses
for the Twelve AVTS - Missing Data Option Used

School	N	Variables Entered	Steps	F Ratio	dF	Multiple R	Per cent of Explained Variance
Columbia-Montour	158	Science grade, Eng. grade, Sex	3	1.09	3 and 154	.42	.18
North-Montco	334	Home Ec. or Ind. Arts grade, Sci. grade, Verbal Music grade	3	5.69	3 and 330	.58	.34
York	430	Home Ec. or Ind. Arts grade, Social Studies grade	2	1.94	2 and 427	.29	.08
West-Side	241	Verbal Music grade, Math grade, Home Ec. or Ind. Arts grade	3	1.23	3 and 237	.31	.10
Lenape	175	English grade, Math grade, Gym grade, Social Studies grade	4	1.48	4 and 170	.51	.26
Centre	107	Science grade, Verbal Music grade, Gym grade, Sex, Home Ec. or Ind. Arts grade, Social Studies grade	6	1.15	6 and 100	.64	.41
Delaware #1	452	Social Studies grade, Home Ec. or Ind. Arts grade	2	2.26	2 and 449	.30	.09
Juniata-Mifflin	147	Science grade, Sex, Math grade	3	1.08	3 and 143	.43	.19
Reading-Muhlenberg	246	Science grade, Sex, Gym grade, Verbal Music grade	4	2.60	4 and 241	.55	.30
Erie	209	Math grade, Art grade, Home Ec. or Ind. Arts grade, Sex	4	1.36	4 and 204	.46	.21
Parkway West	250	Science grade, Social Studies grade, Home Ec. or Ind. Arts grade	3	2.05	3 and 246	.45	.20
Fayette	244	Science grade, Gym grade, Verbal Music grade	3	1.26	3 and 240	.37	.14

Table 27

Intercepts and Regression Coefficients for Multiple Regression Analyses Given in Table 26

School	Variable	Regression Coefficient	Intercept
Columbia-Montour	English grade	0.23	0.46
	Science grade	0.25	
	Sex	-0.34	
North-Montco.	Home Ec. or Ind. Arts grade	0.35	-0.57
	Science grade	0.28	
	Verbal Music grade	0.18	
York	Home Ec. or Ind. Arts grade	0.22	0.99
	Social Studies grade	0.12	
West-Side	Verbal Music grade	0.21	-0.56
	Math grade	0.17	
	Home Ec. or Ind. Arts grade	0.12	
Lenape	English grade	0.14	0.11
	Math grade	0.20	
	Gym grade	0.16	
	Social Studies grade	0.16	
Centre	Science grade	0.12	-0.71
	Verbal Music grade	0.17	
	Gym grade	0.26	
	Sex	0.53	
	Home Ec. or Ind. Arts grade	0.18	
	Social Studies grade	0.15	
Delaware #1	Social Studies grade	0.24	-0.32
	Home Ec. or Ind. Arts grade	0.13	
Juniata-Mifflin	Science grade	0.30	-0.56
	Sex	0.44	
	Math grade	0.16	
Reading-Muhlenberg	Science grade	0.22	-0.91
	Sex	0.75	
	Gym grade	0.17	
	Verbal Music grade	0.15	
Erie	Math grade	0.28	-0.32
	Art grade	0.16	
	Home Ec. or Ind. Arts grade	0.13	
	Sex	0.25	
Parkway-West	Science grade	0.24	-0.51
	Social Studies grade	0.19	
	Home Ec. or Ind. Arts grade	0.12	
Fayette	Science grade	0.23	-0.38
	Gym grade	0.19	
	Verbal Music grade	0.12	

Table 28

Multiple Correlation Coefficients for the Twelve AVTS on Ten Common Independent Predictor Variables (Final Step) Missing Data Option Used

School	R	R^2
Columbia-Montour	0.433	0.187
North-Montco	0.595	0.353
York	0.305	0.093
West-Side	0.407	0.166
Lenape	0.516	0.267
Centre	0.646	0.418
Delaware #1	0.334	0.112
Juniata-Mifflin	0.458	0.210
Reading-Muhlenberg	0.560	0.314
Erie	0.477	0.227
Parkway West	0.468	0.219
Fayette	0.386	0.149