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Title: AN ANALYSIS OF THE ABILITY AND ACHIEVEMENT OF STUDENTS IN CAREER CLUSTER PROGRAMS COMPARED TO STUDENTS NOT IN CAREER CLUSTER PROGRAMS

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Dr. Philip B. Davis

Purpose

The purpose of this study was to compare the ability and achievement of students in career cluster programs to the ability and achievement of students not in career cluster programs. The cluster programs included in this study were Distributive Education, Health Careers, Mechanical, Food Services, Metals, Child Care, Construction, and Office Occupations.

Procedure

This study gathered data with which to compare the achievement and ability of students in cluster programs with those of students in

other academic areas. Through personal contact with the principals and counselors at the schools, access was secured to the cumulative folders, which included compilations of each student's records upon graduation. The data transferred from these folders to the recording form included sex, clusters completed, Differential Aptitude Test scores, and grades received in the minimum graduation requirement classes.

From the data on the recording form, means were computed for both the male and the female students in each cluster. In addition, means were computed for all the cluster students and all the non-cluster students of each sex. Significant differences were determined by comparing each cluster group's mean Differential Aptitude Test scores and GPA with the means for the non-cluster group of the same sex.

Findings

There were 1890 students included in this study of which 372 were cluster students and 1518 were non-cluster students. The mean DAT scores and GPA's of the cluster students were respectively compared to the mean DAT scores and GPA's of the non-cluster students.

An analysis of variance was made between these groups and an F-value was established. An F-value greater than 3.84 is significant at the .05 level. An F-value greater than 6.63 is significant at the .01 level. An F-value greater than 10.83 is significant at the .001 level.

In most cases, there was a significant difference between the cluster and non-cluster students' DAT scores and GPA's. Respectively, cluster students as a group were found to be of lower ability and achievement than non-cluster students, according to the measures used. Six conclusions were drawn from this study and five recommendations developed.

Conclusions

The six conclusions that were drawn from this study are:

1. Students in cluster programs are generally lower in potential ability and academic achievement.
2. There is no significant difference between the DAT scores and GPA's of Health Cluster boys and the DAT scores and GPA of non-cluster boys.
3. There is no significant difference between the GPA of Office Occupation girls and the GPA of non-cluster girls.
4. There is no significant difference in seven out of the eight DAT scores and GPA for boys in the Child Care cluster compared to non-cluster boys.

5. It appears that students in Mechanics, Construction, and Metals clusters are being channeled into the appropriate clusters, as there is no significant difference between the mechanical reasoning and space relations mean DAT scores compared to non-cluster boys' mechanical reasoning and space relations mean DAT scores.
6. The sample size in many cases was not large enough to enable the drawing of any valid conclusions.

Recommendations

Further studies are needed to:

1. Reveal how cluster students are performing in their specific cluster areas.
2. Determine in five years if the addition of new clusters attracts higher ability students.
3. Identify from higher ability and higher achieving students why they are not in cluster programs.
4. Ascertain if the lower ability and lower achieving students are being channeled into new courses added to the school curriculum.
5. Measure academic ability and achievement by a means other than reading.

An Analysis of the Ability and Achievement of Students in Career Cluster Programs Compared to Students Not in Career Cluster Programs

by

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AN ANALYSIS OF THE ABILITY AND ACHIEVEMENT OF STUDENTS IN CAREER CLUSTER PROGRAMS COMPARED TO STUDENTS NOT IN CAREER CLUSTER PROGRAMS

I. INTRODUCTION

For years, vocational classes have had the reputation of being taken by students who were non-college bound, underachieving, and lower ability behavior problems who enrolled in these classes because they were looking for an "easy way out" or because a despairing counselor thought he found an easy way out. Currently, much the same assumption is being made by many educators about the students involved in career cluster programs. In order to guide and counsel youngsters, plan future curriculums, and educate for awareness, it is imperative to determine accurately to what extent such an assumption is justified. This comparative study attempts to provide the basis for such a determination by comparing cluster and non-cluster students' ability and achievement.

Statement of the Problem

This study attempts to compare the ability and achievement of cluster students with those of non-cluster students. Student ability was determined from the scores of the Differential Aptitude Tests. Student achievement was measured by computing a grade point average based on the minimum graduation requirement classes taken by all students. Comparisons were made among the 1890 students who graduated in 1972 and 1973 from Aloha, Beaverton, and Sunset high schools in Beaverton School District 48 of Beaverton, Oregon.

Purpose of the Study

This study sought to compare the abilities and achievements of career cluster students with those of students not involved in the cluster program. Replacing intuitive assumptions with accurate information should help both in guidance and counseling and in future curriculum planning.

Delimitations

Beaverton School District 48 is young and fast growing. Adjoining Portland on the east and extending to the Tualatin Valley on the west, it covers 57 square miles and has a population of about 70,000.

Beaverton is the third largest school district in Oregon. Student enrollment has climbed from 10,000 in 1960 (when the district was formed with the consolidation of 13 small districts) to slightly over 19,500 today.

The three high schools in the Beaverton School District have been included in the study. These are Aloha, Beaverton, and Sunset, with a current enrollment of 1409, 1676, and 1700, respectively.

The entire graduating classes of 1972 and 1973 were included in the study, with the exception of those transfer students who had not taken the DAT, who were approximately 30% of the graduating student population.

Definition of Terms

The terms used in this report which need definition are ability, achievement, GPA, cluster, cluster student, non-cluster student, and DAT.

Ability

Ability has been determined by studying the results of the Differential Aptitude Test (DAT), which was administered during the tenth grade to the 1972 and 1973 graduates from Aloha, Beaverton, and Sunset High Schools.

Achievement

The accumulative grade point average of the minimum graduation requirement classes for the 1972 and 1973 graduates from Aloha, Beaverton, and Sunset High Schools.

GPA

To insure valid comparison of achievement, the grade point average (GPA) for this study was computed by averaging only those grades for classes taken in common by cluster and non-cluster students. These were those classes, exclusive of electives, in which each student was required to be enrolled in order to meet the minimum graduation requirements as specified on the recording form (Appendix A). Grades were averaged on the basis of four points for an A, three for a B, two for a C, one for a D, and zero for an F.

Cluster

A family of occupations that are related to each other by common skills and knowledges. The Oregon cluster is predicted on a manpower base of at least 10,000 workers presently employed and a need of 2,000 replacement workers during the next five years. Curriculum guides have been developed jointly by the representative industries and the Oregon Board of Education. The Oregon cluster represents the broad occupational approach, that is, the key occupations are explored within each cluster. The identification of the key occupations in each cluster indicates the multitude of jobs that exist in each key area. The identification of the jobs in each key occupation reqults in a task analysis. The task analysis requires certain performance levels, which in turn result in the skill and knowledge needed by the student to obtain gainful employment or articulate with apprenticeship, armed forces technical schools, the community college, or in some cases a four-year university. Cluster courses are taught at the eleventh and twelfth grades. Both boys and girls are enrolled in cluster courses.

Cluster Student

All cluster students studied in this survey received at graduation at least one credit for one of the following cluster courses (see Appendix B for fuller definitions).

Distributive Education. The D.E. program provides both classroom work and on-the-job training in retail, wholesale, and service occupations.

Health Careers. This program explores the professional, technical, and business applications of health occupations through classroom and on-the-job experience.

Mechanical. The Mechanical cluster provides basic education and skills in mechanical, electrical, and fluid technology.

Food Services. This course explores employment within the Food Services industry through classroom and field experiences.

Metals. The family of metals occupations is explored through shop instruction and on-the-job experience.

Child Care. Child Services provides practical experience and seminar instruction in exploring the Child Care field.

Construction. This program provides classroom instruction and on-the-job training in the building trades.

Office Occupations. This cluster combines classroom instruction with on-the-job training for senior students who seek careers in the office occupations.

Non-cluster Student

Any student who is not enrolled in a cluster program.

DAT

The Differential Aptitude Tests (The Psychological Corporation, 304 East 45th Street, New York, New York 10017) are an integrated battery of standardized tests used for measuring the abilities of students in grades eight through twelve for the purpose of educational and vocational guidance. Results are reflected in national norm percentile scores. The Differential Aptitude Test (DAT) scores used in this study are verbal reasoning, numerical ability, abstract reasoning, mechanical reasoning, space relations, spelling, sentence structure, and clerical speed and accuracy. These DAT tests are described in Appendix C.

Summary

This study has attempted to compare the academic achievement and potential ability of cluster and non-cluster students. The DAT scores and the minimum graduation requirement GPA's of the cluster students have been compared to those of graduating seniors enrolled in other academic areas in Beaverton School District 48, Beaverton, Oregon.

The results of this survey should be useful in curriculum development, for guidance and counseling of students in cluster programs, and to verify or disprove the assumption that cluster students are of below average ability and achievement.

II. RELATED LITERATURE

The review of literature chapter begins with the cluster approach to education, followed by attitudinal reviews, then ability and achievement reviews.

Cluster Approach

In an article entitled, "An Organizational Technique to Facilitate the Delivery of Career Education," (1972), the U.S. Office of Education stated that in a career education program, each student is helped to develop a very broad awareness of the full range of career options in the world of work. At the same time, the student is helped to develop his own self-awareness, to become cognizant of his own strengths and weaknesses, his aptitudes and capabilities, and his interests and needs so that he can make a realistic consideration of himself in relation to the many career options available in the world of work. In addition, the student is helped to practice and develop logical direction-setting and decision-making skills which will be useful to him throughout his lifetime in considering alternative career possibilities.

After becoming aware of the full range of career options in the world of work, each student is provided with opportunities to explore in considerable depth those kinds of careers which he feels are of most interest to him and most suited to his needs and capabilities. He has a chance, through realistic exploratory experiences, to test himself against the activities and requirements typical of a number of career areas of his choice.

They further state the student is then in a position to make a rational choice of an appropriate career goal. They feel this thorough and systematic approach to career possibilities is far better for the individual than the currently prevalent practices, which make career selection more a matter of happenstance than a rational activity. Once a student has established for himself a tentative career goal, the U.S. Office of Education states the student should then be helped to plan an appropriate educational path to that goal, and is provided with those educational programs and work experiences which will enable him to achieve the goal. For a given student, depending upon the nature of his particular career goal, the educational path may involve going through a four-year college, going to a two-year college, or going through job preparation experiences at the secondary-school level which will enable him to go directly to work when he leaves high school.

The problems of delivering this type of comprehensive career education are compounded by the complexity of the American economy and the diversity of the American labor force. The *Dictionary of Occupational Titles*, for example, lists more than 20,000 individual jobs. Obviously, dealing with each of these individual jobs would be administratively impossible when designing and implementing a career awareness program or when providing other aspects of career education. The only feasible solution seems to be to group these jobs into a series of manageable clusters. While it is not possible to deal with 20,000 separate jobs, it would be feasible to deal with 15 or 20 broad career clusters.

Any scheme which is developed for clustering jobs for career education purposes should meet four basic requirements:

1. The cluster scheme should be such that it encompasses all the jobs in the Dictionary of Occupational Titles. In other words, after the cluster scheme has been established, it should be possible to fit each and every job in the Dictionary of Occupational Titles into some one of the career clusters which have been designated.

2. Each cluster should include jobs at all levels, from entry-level through skilled jobs, technical jobs, and professional jobs. That is to say, each cluster should contain a logical career ladder of jobs requiring increasing levels of education.

3. Each cluster should be related to an identifiable group of employers. For example, if we have a cluster in the health occupations, it is possible to identify within the community a group of potential employers, such as hospital administrators, private physicians, and dentists, who could relate to this particular cluster. Similarly, if we have a cluster in the construction occupations it is possible to identify in a given community various construction contractors and construction firms who could relate to this career cluster.

4. The clusters should be enduring over time. That is, each cluster should represent a continuing societal function which will be carried on throughout the foreseeable future. For example, it can be assumed that for the foreseeable future our society will be manufacturing things, constructing things, transporting things, and providing health services for the people. Therefore, clusters in the manufacturing occupations, the construction occupations, the transportation occupations, and the health occupations are likely to be enduring over time. Although individual jobs within these clusters may be phased out due to technological change, other new and emerging jobs will appear in each cluster to take the place of those phased out. If an individual has had well-rounded training in the common core of a particular cluster, his flexibility for moving to another job within that cluster will be facilitated, should his present job disappear as a result of technological change. Having mastered the common core of the cluster, he would be able, with a minimum amount of retraining, to move to another type of emerging job within that same cluster. This will provide individuals with the flexibility needed to cope with the changing nature of our economy and our labor force.

The U.S. Office of Education has developed a cluster scheme which, it is believed, meets the four requirements specified above. This cluster scheme consists of 15 career clusters, which are:

Construction Occupations Cluster
Manufacturing Occupations Cluster
Transportation Occupations Cluster
Agr-Business and Natural Resources Occupations Cluster
Marine Science Occupations Cluster
Environmental Occupations Cluster
Business and Office Occupations Cluster
Marketing and Distribution Occupations Cluster
Communications and Media Occupations Cluster
Hospitality and Recreation Occupations Cluster
Personal Service Occupations Cluster
Public Services Occupations Cluster
Health Occupations Cluster
Consumer and Homemaking Occupations Cluster
Fine Arts and Humanities Occupations Cluster

In an article entitled, "The Oregon Way," (1969), Dr. Dale Parnell, the Superintendent of Public Instruction, has proposed guidelines for education in Oregon's public schools. Parnell's philosophy is that secondary schools should be preparatory institutions for <u>all</u> students, and secondary-school preparatory programs should tie the curriculum to the goals of students in such a way that they are motivated while in school. Students then are also better equipped to choose from many alternatives as they take the next step after high school.

Parnell feels that the career-cluster program will require five major changes in school systems. First, high schools must make a definite commitment to move from the present tracking system. Second, it will be necessary to give general education a massive infusion of illustrations from the world of work. Third, high school curricula will need to be rebuilt around the family of occupations concept, so that students may select a career at the beginning of their high school experience and then tie a majority of their high school experience into this generalized goal. Fourth, specific occupational training will become largely the responsibility of post-high school institutions. Fifth, every school and community college must have guidance and counseling programs that will guide students through the process of selecting a career goal.

Under the direction of the public superintendent (Oregon Board of Education, 1970), the career clusters being planned and implemented in Oregon's high schools are: Accounting, Agriculture, Clerical, Construction, Domestic and Custodial, Electrical, Food Service, Graphic Arts, Health, Marketing, Managerial, Mechanical and Repair, Metals, Secretarial, Social Services, Textiles, Transportation, and Wood Products.

Parnell's philosophy on career education can be summarized as follows: The American school must be truly comprehensive and meet the needs of all students. Many changes in the high school curriculum may be necessary in order that every student may tie the curriculum to his or her career goals.

Benham (1967) feels that few high schools offer a comprehensive curriculum. As principal of a large high school in Hudson, Ohio, he observes that many schools offer a watered-down curriculum for non-college bound students. Benham feels that the vocational high school is not the answer as it serves only a small percentage of students. He found that only 30 percent of the students that graduated from his high school actually received degrees from a four-year college. Four programs were added to give Hudson's curriculum a comprehensive approach. They were: (1) a prevocational exploratory program; (2) a broad career-guidance program designed to allow the student to find an area of interest; (3) a work experience program; and

(4) an occupational cluster program that allows students to obtain saleable skills at the eleventh and twelfth grades. Hudson's total approach to career education is in agreement with the five major goals proposed by Parnell of Oregon.

At the heart of the new curriculum is the cluster approach. The aim of the cluster is to attain the comprehensive high school.

Sheets and Dahlor (1967) describe the problem that faces vocational educators in Kansas City, Missouri. They observe that in the past, people were exposed to the occupations of their community through personal contact. Today, many young people have little concept of their father's occupation, and their fathers in turn have little knowledge of the actual work performed by their neighbors. Many urban citizens have never had the opportunity to make contact with the world outside their own employment experience. There seems a great need for assistance in making valid occupational choices. It is logical to assume that wise choices can best be made if there are opportunities to study, examine, and experience job clusters. Sheets and Dahlor feel that the implementation of a total program of vocational education can be divided into three phases, introduction to vocational classes, job cluster training experience, and specific training in technical skills. They elaborate by explaining that the introduction to vocations can be offered at grade levels seven, eight, or nine. These must not be textbook courses but live situations involving the business and industrial community in presentations and school visits, as well as films, articles, and reports. In the Kansas City system, the job cluster courses can be offered in the ninth and tenth grades and are open to all students. They also state that these cluster courses can be provided in a comprehensive high school through team teaching, with both vocational and industrial arts teachers as members of the team.

The Kansas City plan involves the junior high schools, the comprehensive senior high schools and one or more of the strategically located vocational technical area facilities. The skill center is available to junior and senior high school students and to post-high school students and adults. The Kansas City high school program is developed around the cluster concept. It gives students the opportunity to discover and identify their occupational interest and aptitudes while participating in the development of saleable occupational skills. The third phase of the program is available to youth from the entire school district. Here, the courses become far more specialized. The Kansas City authorities present the following arguments in favor of the cluster concept:

1. It provides a realistic introduction to vocations.
2. It provides exploratory experiences to all youth around skill development and the occupational clusters.

3. It combines a vocational center concept with the decentralized approach offering a total program designed to improving the validity of occupational selection for school youth.

Maley (1967) states that the Maryland version of the cluster concept groups occupations that require the same proficiencies in a number of areas. Measurement, communication, mathematical and science, skills, and general information are the most common proficiencies. This concept is based on the idea of preparing for the work in a series of occupations related in their requirements. The Maryland effort in clustering has been directed to first and second level tasks performed by the individual upon entering the occupation. It is based on the notion of growth on the job. Maley defends the Maryland cluster on a number of points. The cluster allows students to explore. The cluster provides a broad range of related occupations that gives the student the opportunity of trying several skill related areas. The cluster is aimed at vocational competence. The cluster allows for mobility within an industry. The cluster concept provides opportunities for a greater number of students to take advantage of vocational education and employment opportunities upon graduation.

The clusters that have been identified in the work done at the University of Maryland include:

The construction cluster:

- carpenter
- electrician
- mason
- painter
- plumber

The electro-mechanical installation and repair cluster:

- air-conditioning serviceman
- refrigeration serviceman
- business machines serviceman
- home appliances serviceman
- radio and television serviceman

Metal forming and fabrication cluster:

- assembler
- machining
- sheet metal worker
- welder

The human service cluster:

- skills and understanding of nutrition
- food services
- food handling
- home management
- institutional management

beauty culture

horticulture

health services

recreation

Attitudinal Reviews

Navara (1973) conducted a study to determine if there were statistically significant differences among the opinions of teacher-coordinators, administrators, and guidance counselors concerning cooperative vocational education. The objectives of the study were: (1) to determine if there were differences in the opinions of the three groups as to the value and the operational procedures of cooperative vocational education; (2) to test the hypothesis that there is no significant difference among the opinions of the three groups; (3) to list recommendations that should be considered for additional research and teacher education activities; (4) to develop guidelines that should be considered in the further development of cooperative vocational education programs in Oregon.

The construction and validation of the questionnaire were accomplished through a review of the literature and an evaluation by three juries of experts. A mail survey questionnaire containing 26 value statements and 34 operational procedures together with a five-point Likert-type scale was used to gather the data.

The study's population utilized 77 Oregon secondary schools which offered five or more occupational clusters. The sample for the study consisted of 50 full-time administrators, 50 full-time guidance counselors, and 50 full-time teacher-coordinators, all randomly selected from the schools identified in the population.

The findings showed that the analysis of variance test indicated that the three groups were alike in their responses to the statements contained in the questionnaire but significant differences did occur in five of the 26 value statements and seven of the 34 operational procedures.

The testing of the mean scores indicated that the three groups were similar in their responses. The hypothesis was retained on 48 of the 60 statements. The three groups generally agreed that there was some value in cooperative vocational education programs. They generally agreed on 32 of the 34 operational procedures.

In view of the findings and conclusions of the study, Navara recommended that additional research be conducted using students and persons outside education to assess the value and operational procedure statements. Navara also recommended that teacher education activities and in-service activities be conducted in relationship to cooperative vocational education.

Navara suggests the following guidelines as essential to program development and growth in Oregon:

1. All students 16 years and older should have an opportunity to enroll.
2. Guidance personnel should become more involved in the organization and operation of the program.
3. The teacher-coordinator should be hired on an extended contract basis.
4. The program should consist of three components: classroom instruction, youth organization, and on-the-job experiences.

Several interviews were conducted with educators to determine attitudes towards cluster programs and students enrolled in these cluster programs. Each person interviewed was asked: (1) In your opinion, why were career education cluster programs developed; and (2) in your opinion, what is the potential ability and academic achievement of students in cluster programs compared to students not in cluster programs. The results of these interviews are as follows.

1. Mr. Ken Box, Director of Career Education for School District 48, says that the cluster programs have been established in Beaverton in response to a recognized need to provide school programs for all students and to balance the offerings in the direction of those students not preparing for entry into a four-year college.

Mr. Box also said that generally, lower ability and lower achieving students will be attracted to the cluster programs. A primary reason is that these students see more value in a cluster program than in a program that doesn't prepare them for job entry.

2. Mrs. Pat Thomas, Counselor, Beaverton High School, says she believes the cluster programs were developed for several reasons. First of all, to serve as an exploratory program for the student who is undecided about the career he wants to pursue in later life. The program could give him a good insight into the training necessary for the particular job, the requirements of the job, actual working conditions, pay scale, etc. Secondly, the programs were developed to serve the needs of many students who did not plan to continue with any post-high school training and needed some definite skills with which to enter the world of work.

Mrs. Thomas also says that the potential ability and academic achievement of students in the cluster programs vary from cluster to cluster. However, she is convinced that overall the potential ability and academic achievement of cluster students is lower than that of the average student. She also feels that this is not necessarily a "bad" thing. Although the academic achievement and potential ability is lower, often the motivation is high. It is a place where this type of student can work hard and yet have a feeling of success. It also gives him skills that he will be able to use for the rest of his life. Perhaps it is the first time in his life that he has a feeling of worth, a sense of achievement, and confidence in his own ability.

3. Mr. Tom Hill, Career Education Coordinator, Beaverton High School, says cluster programs were developed to provide students with entry-level job skills and to being the "world of work" into the schools. For years schools only concerned themselves with college-bound students; now the concern is for all students.

Mr. Hill says that the time is past for cluster programs to serve as a dumping ground for poor students and trouble makers.

4. Mrs. Barbara Kokich, Counselor, Beaverton High School, says cluster programs were developed so that the high school could provide the student who did not plan to go on to college some skill and training which would enable him to obtain an entry-level job. She also feels they were developed so that a student could explore a cluster of careers and then pick one main area to pursue afterward, probably in community college or a four-year college.

Mrs. Kokich also says, in her opinion, the potential ability and academic achievement of these students varies greatly. She feels that the students in Health careers, for example, would be academically more proficient than the students in Metal or Construction. She doubts if a blanket statement regarding this could be made for all students, in all cluster areas.

5. Mr. Phil Corson, Media Specialist, Beaverton School District, says the cluster programs were developed in order to give students concentrated instruction in one area of specialization with

experience on the job. He believes this new approach in education came into use because the traditional text book method was not the best way to communicate certain types of skills.

Mr. Corson also believes the cluster programs are looked upon with more interest than other academic oriented courses. Not necessarily because they are looked upon as under-achievers, but because students are not motivated by standard text book methods.

6. Mr. Art Campbell, teacher, Beaverton High School, says cluster programs were developed to allow the world of work to be organized in logically related career sequences for the school curriculum. These career sequences or related jobs are grouped together for instructional purposes and these groupings we call clusters.

Mr. Campbell feels the potential ability and academic achievement of the students in cluster programs is unlimited, depending upon the individual. Since many clusters cross all levels of education, training or on-the-job skills, the potential academic ability would depend entirely upon the professional technical or unskilled ambition levels of each student. Often workers progress through several levels of work in the same job category over a number of years. This process requires success at beginning and succeeding levels, generally referred to as job advancement. Factors such as persistence and determination, which are hard to observe and measure, can, in combination with unknown circumstances in the future, greatly affect an individual's achievement. The key factor seems to be the maturation process, how soon it becomes fully developed, and how it is used in the decision making process.

7. A teacher in the Beaverton Schools who preferred to remain anonymous believes the potential ability and academic achievement of students in cluster programs differs according to the specific cluster and the overall school and community situations. If the cluster happens to be popular and attracts a large number of students, screening takes place and low-level students are not enrolled. If the cluster involves placement of students in jobs in the business community, low-level students are not encouraged to enroll in the cluster. In the first few years of a cluster program, the enrollment is restricted. Conversely, if the cluster is not successful in attracting enough students and is in danger of being dropped, or cut back, then low-level students are encouraged or recruited by instructors and counselors.

The teacher also says that, from his observations, those students in the cluster program are at least average in ability and academic achievement. If a student is a real "loser", he lacks the ambition and/or confidence to involve himself in such a program. There are lots of easier ways to get through school or get a job than to become part of a cluster program, which is more demanding than just coasting along. There are clusters of a less demanding nature that hopefully may attract the low-level student and be of real service to him, as well as being of value to the average and above average student.

Ability and Achievement Reviews

Cumming (1966) discusses a first-year evaluation of outreach counseling in four poverty areas of Minneapolis. One counselor and one clerk were placed in each of three schools to work with graduates and dropouts of the class of 1965 and with community members or institutions seeking help. The counselor's activities included contacts with the individual students who had left school, parents, business representatives, social agency representatives, and education institutions.

A detailed followup study was conducted. Results of this study showed that differences between the high school graduates and the dropouts were significant at the .001 level on a chi-square test in such areas as present work, school attendance, father's occupation, and family status. A comparison of different aptitude tests showed the graduates with higher mean raw scores and higher average marks in the ninth grade. Other areas compared were vocational and educational plans and participation in school activities of the graduates and dropouts. The report suggests areas of future work for the outreach counselors and uses of data collected in the followup study.

Urdal (1963) conducted a study to isolate factors related to leaving school early. Data was obtained on all twelfth, eighth, and fourth grade students in the Spokane public schools. Analyzed were (1) personal variables within the school situation in the twelfth grade, (2) factors associated with dropouts in the eighth grade, and (3) characteristics of fourth grade pupils in terms of dropout associated factors. Variables included the following: (1) intelligence, (2) scholastic achievement, (3) school adjustment, (4) school related experience, and (5) personal and social adjustment.

Verbal facility and language skills, student attitudes toward school, and participation in cocurricular activities emerged as strong determinants of continuance and success in school. Students with parents in higher level occupations also tended to remain in school longer.

The data indicate a need for more vocational planning on the twelfth grade level. Variables characterizing the dropout are course failures or repeated grades, attendance at more schools, and poor attendance records. Data collection was facilitated by uniform cumulative records. Followup studies of the twelfth, eighth, and fourth grade populations are recommended.

In a symposium by Enos Perry and others, questions were asked regarding what should be done with our students of lower academic ability and how they could earn a living in the businesses of today and tomorrow. Following are some contributions by this symposium that try to take a realistic and sympathetic point of view:

1. Enos Perry (1969) said that students of lower academic ability must be identified. He also said that we must list and identify the different business positions they can fill, and make practical suggestions about the suitable subjects and teaching techniques required to educate them.

2. Maxie Lee Work said we must: (1) develop the stronger qualities of our less gifted students; (2) develop a desire to teach them; and (3) ceaselessly search for teaching techniques adapted to guiding their learning.

3. Dorothy Schwartz said that in dealing with students of lower ability, our problem is to discover the individual's special deficiency, encourage him in his areas of normalcy, and guide him as well as possible.

4. Hazel Flood said that all students should be permitted to take business courses in the secondary school if: (1) they can profit by the experience; (2) they are educable; (3) they want to learn; (4) equipment is available to teach them; (5) jobs are available that require a lesser degree of ability; and (6) the students have enough natural ability to learn vocational applications of the skills.

5. Margaret Andrews said that the two keys in working with students of lower ability, who are in our schools and there to stay,

are to open student potential and to open job potential.

6. Harland Sampson speaks for the distributive education program and said that the capacity of the distributive education program to serve students of lower ability is limited only by the adaptability of the coordinator, the availability of student training stations, and the presence of materials and facilities suited to the needs of each student.

Vast numbers of students who once dropped out of school or were eased or pushed out before graduation are now staying longer. This problem is discussed by Thomas A. Rothchild on how we identify and help the slow learner. At one time, there was no place in the secondary school for the slow learner, but now schools are attempting to sustain their interest, find a program of value to them, and bring them into the mainstream of secondary education.

Thomas Rothchild said that attention must be turned to the slow learners, since they represent such a sizeable number of students new to the secondary school. In a standard population of students, from 15 to 20 percent would be classified as slow learners.

There is no scientific scale available for the identification of slow learners, but they can be defined as those whose general educational potential is below average but not so low as that of the educable retarded. Characteristics attributed to the slow learner identified by Rothchild are:

1. The achievement record of the slow learner is below average.
2. His reading comprehension is below average, and he is usually more than two years below grade level in reading skills and comprehension.
3. He has a shorter-than-average attention span when he is faced with traditional school work.
4. He is "now oriented" rather than "future oriented." He needs to see the present value of an activity because he thinks little of the future.
5. He is easily discouraged by traditional school work which he has faced with failure for years.
6. He cannot handle abstractions too well.
7. He has had little to work with because, in the past, few instructional materials have been planned specifically for this type of student.
8. He does not fit well socially into the usual school pattern of extracurricular activities.
9. He does not work well when grouped with the student who tests as average or above but who is resisting his school environment.
10. He needs routine, but he also must have variety within the routine.
11. He can learn and wants to learn, but he requires more time to achieve than does the average learner.

Rothchild states that education must accept the challenge of providing useful school experiences specifically for the slow learner. A program would be best planned cooperatively with a sympathetic administration, which has the necessary factual data to help in identification of the slow learner and for future counseling.

III. PROCEDURES

Introduction

This study gathered data with which to compare the achievement and ability of students in cluster programs with those of students in other academic areas. Through personal contact with the principals and counselors at the schools, access was secured to the cumulative folders which included compilations of each student's records upon graduation. The data transferred from these folders to a recording form included sex, clusters completed, DAT scores, and grades received in the minimum graduation requirement classes.

From the data on the recording form, means were computed for both the male and the female students in each cluster. In addition, means were computed for all the cluster students and all the non-cluster students of each sex. Significant differences were determined by comparing each cluster group's mean DAT scores and GPA with the means of the non-cluster groups of the same sex.

Selection of Sample

All 1972 and 1973 graduating students from Beaverton School District 48 of Beaverton, Oregon, were included in this study. This excluded those transfer students who did not take the DAT test.

Time Involved

The total time involved for this study was approximately eight months.

Personal Contact

Each principal and guidance counselor at the respective schools was contacted prior to the survey. This was done to assure participation and to explain fully the purpose and procedures of the study. Arrangements were made and a schedule was set up reflecting the most suitable times to obtain the data from the cumulative records. Since these cumulative folders were in the school vaults, special arrangements had to be made for reviewing them outside of regular school hours.

Collection of Data

A recording form was used to compile the information needed for this study. The recording form (Appendix A) includes the following information:

1. Sex
2. Cluster student: This reflects whether or not he is a cluster student as identified in Chapter I.
3. Cluster classes completed: This reflects the cluster classes completed and thus identifies an individual as a cluster student.

4. DAT: This indicates the verbal reasoning, numerical reasoning, abstract reasoning, mechanical reasoning, space relation, spelling, sentence structure, and clerical speed and accuracy scores from the Differential Aptitude Tests as defined in Chapter I. The DAT scores are used for both cluster and non-cluster students.
5. Grade from minimum graduation requirement classes: This reflects the grade point averages of both cluster and non-cluster students for classes taken in common.

Mean Scores

Mean DAT and GPA scores were computed for all cluster and non-cluster students as well as for each cluster.

Significant Difference

In order to determine if the findings were valid, it was necessary to evaluate the difference between the cluster and non-cluster students' mean DAT and GPA scores. To accomplish this, the significance of the differences were determined from the following F statistic:

$$F = \frac{MSbg}{MSwg}$$

F = F value

MSbg = mean square between groups

MSwg = mean square within groups

Findings

It is hoped the findings will be beneficial to all concerned in the scheduling and placement of students. This includes teachers, counselors, and educators in general.

The findings comparing the cluster students and non-cluster students involved in this study include:

1. The number of students involved.
2. The mean DAT score of cluster and non-cluster students.
3. The mean GPA of cluster and non-cluster students.
4. The significance of the differences between cluster students' and non-cluster students' mean DAT and GPA's.

Summary

All graduates from the classes 1972 and 1973 included in this study were classified as cluster or non-cluster students. The cluster students were identified by cluster. Their DAT scores and GPA's have been recorded and tabulated to reflect the mean DAT's and GPA's of each group. The results were then compared.

IV. FINDINGS

Introduction

The following tables compare the potential ability and academic achievement of cluster students to that of non-cluster students. Each table represents the mean DAT scores and GPA's of either the male or female students in a particular cluster compared with the means for all non-cluster students of that sex. The final table compares the total group of cluster students with the total group of non-cluster students. The data in the tables include:

1. Mean DAT scores and GPA's in each cluster group.
2. Corresponding means for the non-cluster students of the same sex.
3. An F-value resulting from the analysis of variance between these two groups. An F-value greater than 3.84 is significant at the .05 level. An F-value greater than 6.63 is significant at the .01 level. An F-value greater than 10.83 is significant at the .001 level.

Findings

Tables 1 through 13 compare mean DAT scores and GPA's of particular cluster groups with non-cluster students. Tables 14 and 15 compare mean DAT scores and GPA's of all cluster groups to non-cluster students.

Table 1. Distributive education - girls. 64 cluster/737 non-cluster

	Cluster	Non-cluster	F-value	
Verbal reasoning	43.36	60.17	25.48	***
Numerical ability	34.48	52.64	26.58	***
Abstract reasoning	54.44	65.27	10.30	**
Mechanical reasoning	52.11	59.01	3.76	
Space relations	51.11	62.80	10.84	***
Spelling	44.97	54.22	6.48	*
Sentence structure	33.92	51.06	28.23	***
Clerical speed	43.69	46.19	.51	
GPA	2.29	2.90	56.59	***

* significant ($\underline{P} < .05$)
** significant ($\underline{P} < .01$)
*** significant ($\underline{P} < .001$)

Table 2. Distributive education - boys. 63 cluster/781 non-cluster

	Cluster	Non-cluster	F-value	
Verbal reasoning	44.14	58.75	20.19	***
Numerical ability	41.07	53.91	12.01	***
Abstract reasoning	50.17	64.74	17.17	***
Mechanical reasoning	43.25	56.20	13.22	***
Space relations	44.75	61.34	25.28	***
Spelling	41.61	56.58	16.81	***
Sentence structure	37.14	51.30	19.87	***
Clerical speed	37.25	44.87	4.62	*
GPA	1.98	2.60	53.28	***

* significant ($\underline{P} < .05$)
** significant ($\underline{P} < .01$)
*** significant ($\underline{P} < .001$)

Table 3. Health - girls. 70 cluster/737 non-cluster

	Cluster	Non-cluster	F-value	
Verbal reasoning	49.01	60.17	12.17	***
Numerical ability	42.00	52.64	9.72	**
Abstract reasoning	52.36	65.27	16.06	***
Mechanical reasoning	51.07	59.01	5.47	*
Space relations	49.80	62.80	15.04	***
Spelling	49.60	54.22	1.77	
Sentence structure	39.29	51.06	14.46	***
Clerical speed	42.07	46.19	1.50	
GPA	2.62	2.90	12.71	***

* significant ($\underline{P} < .05$)
** significant ($\underline{P} < .01$)
*** significant ($\underline{P} < .001$)

Table 4. Health - boys. 16 cluster/781 non-cluster

	Cluster	Non-cluster	F-value
Verbal reasoning	50.31	58.75	1.78
Numerical ability	53.00	53.91	.02
Abstract reasoning	59.94	64.74	.51
Mechanical reasoning	60.88	56.20	.46
Space relations	57.19	61.34	.43
Spelling	50.94	56.58	.62
Sentence structure	45.81	51.30	.78
Clerical speed	41.56	44.87	.24
GPA	2.55	2.60	.09

* significant ($\underline{P} < .05$)
** significant ($\underline{P} < .01$)
*** significant ($\underline{P} < .001$)

Table 5. Mechanics - girls. 1 cluster/737 non-cluster

	Cluster	Non-cluster	F-value
Verbal reasoning	40.00	60.17	.62
Numerical ability	25.00	52.64	1.02
Abstract reasoning	90.00	65.27	.91
Mechanical reasoning	97.00	59.01	1.95
Space relations	70.00	62.80	.07
Spelling	35.00	54.22	.47
Sentence structure	70.00	51.06	.56
Clerical speed	5.00	46.19	2.33
GPA	3.10	2.90	.11

* significant ($P < .05$)
** significant ($\underline{P} < .01$)
*** significant ($\underline{P} < .001$)

Table 6. Mechanics - boys. 37 cluster/781 non-cluster

	Cluster	Non-cluster	F-value	
Verbal reasoning	41.38	58.75	17.20	***
Numerical ability	37.32	53.91	12.09	***
Abstract reasoning	52.62	64.74	7.22	**
Mechanical reasoning	61.14	56.20	1.13	
Space relations	61.70	61.34	.01	
Spelling	40.92	56.58	10.90	***
Sentence structure	37.97	51.30	10.58	**
Clerical speed	36.57	44.87	3.36	
GPA	1.80	2.60	54.64	***

* significant ($P < .05$)
** significant ($\underline{P} < .01$)
*** significant ($\underline{P} < .001$)

Table 7. Construction - boys. 14 cluster/781 non-cluster

	Cluster	Non-cluster	F-value	
Verbal reasoning	44.64	58.75	4.41	*
Numerical ability	41.50	53.91	2.62	
Abstract reasoning	54.29	64.74	2.12	
Mechanical reasoning	56.07	56.20	.00	
Space relations	65.71	61.34	.42	
Spelling	34.50	56.58	8.47	**
Sentence structure	38.57	51.30	3.73	
Clerical speed	36.07	44.87	1.46	
GPA	2.14	2.60	6.99	**

* significant ($\underline{P} < .05$)
** significant ($\underline{P} < .01$)
*** significant ($\underline{P} < .001$)

Table 8. Metals - boys. 12 cluster/781 non-cluster

	Cluster	Non-cluster	F-value	
Verbal reasoning	37.92	58.75	8.37	**
Numerical ability	19.17	53.91	17.83	***
Abstract reasoning	49.17	64.74	4.04	*
Mechanical reasoning	51.50	56.20	.35	
Space relations	46.25	61.34	4.30	*
Spelling	39.42	56.58	4.39	*
Sentence structure	27.92	51.30	10.80	**
Clerical speed	25.83	44.87	5.93	*
GPA	1.90	2.60	13.64	***

* significant ($\underline{P} < .05$)
** significant ($\underline{P} < .01$)
*** significant ($\underline{P} < .001$)

Table 9. Food services - girls. 6 cluster/737 non-cluster

	Cluster	Non-cluster	F-value	
Verbal reasoning	45.83	60.17	1.87	
Numerical ability	49.67	52.64	.07	
Abstract reasoning	43.17	65.27	4.31	*
Mechanical reasoning	38.83	59.01	3.29	
Space relations	55.00	62.80	.50	
Spelling	49.17	54.22	.19	
Sentence structure	43.67	51.06	.50	
Clerical speed	31.00	46.19	1.90	
GPA	2.25	2.90	6.48	*

* significant ($\underline{P} < .05$)
** significant ($\underline{P} < .01$)
*** significant ($\underline{P} < .001$)

Table 10. Food services - boys. 12 cluster/781 non-cluster

	Cluster	Non-cluster	F-value	
Verbal reasoning	43.33	58.75	4.55	*
Numerical ability	46.67	53.91	.77	
Abstract reasoning	61.50	64.74	.17	
Mechanical reasoning	40.67	56.20	3.83	
Space relations	53.92	61.34	1.03	
Spelling	41.17	56.58	3.53	
Sentence structure	29.75	51.30	9.12	**
Clerical speed	25.33	44.87	6.24	*
GPA	2.18	2.60	5.08	*

* significant ($\underline{P} < .05$)
** significant ($\underline{P} < .01$)
*** significant ($\underline{P} < .001$)

Table 11. Child care - girls. 26 cluster/737 non-cluster

	Cluster	Non-cluster	F-value	
Verbal reasoning	38.31	60.17	18.06	***
Numerical ability	24.81	52.64	26.17	***
Abstract reasoning	44.96	65.27	15.34	***
Mechanical reasoning	45.81	59.01	5.89	*
Space relations	42.61	62.80	14.03	***
Spelling	30.19	54.22	18.47	***
Sentence structure	33.31	51.06	12.55	***
Clerical speed	27.23	46.19	12.53	***
GPA	2.15	2.90	36.29	***

* significant ($P < .05$)
** significant ($P < .01$)
*** significant ($P < .001$)

Table 12. Child care - boys. 4 cluster/781 non-cluster

	Cluster	Non-cluster	F-value	
Verbal reasoning	31.25	58.75	4.89	*
Numerical ability	37.50	53.91	1.32	
Abstract reasoning	50.00	64.74	1.22	
Mechanical reasoning	42.50	56.20	1.00	
Space relations	48.75	61.34	1.01	
Spelling	29.50	56.58	3.68	
Sentence structure	35.00	51.30	1.75	
Clerical speed	38.75	44.87	.21	
GPA	2.08	2.60	2.59	

* significant ($P < .05$)
** significant ($P < .01$)
*** significant ($P < .001$)

Table 13. Office occupations - girls. 57 cluster/737 non-cluster

	Cluster	Non-cluster	F-value	
Verbal reasoning	48.98	60.17	10.20	**
Numerical ability	49.56	52.64	.67	
Abstract reasoning	59.59	65.27	2.57	
Mechanical reasoning	51.30	59.01	4.26	*
Space relations	55.40	62.80	4.00	*
Spelling	53.63	54.22	.24	
Sentence structure	42.11	51.06	6.82	**
Clerical speed	45.87	46.19	.01	
GPA	2.76	2.90	2.35	

* significant ($\underline{P} < .05$)
** significant ($\underline{P} < .01$)
*** significant ($\underline{P} < .001$)

Table 14. All female cluster students - all female non-cluster students. 224 cluster/737 non-cluster

	Cluster	Non-cluster	F-value	
Verbal reasoning	46.17	60.17	52.49	***
Numerical ability	39.88	52.64	38.33	***
Abstract reasoning	53.86	65.27	33.33	***
Mechanical reasoning	50.73	59.01	15.83	***
Space relations	50.95	62.80	33.29	***
Spelling	46.99	54.22	12.04	***
Sentence structure	38.04	51.06	49.96	***
Clerical speed	41.28	46.19	5.73	*
GPA	2.50	2.90	68.38	***

* significant ($\underline{P} < .05$)
** significant ($\underline{P} < .01$)
*** significant ($\underline{P} < .001$)

Table 15. All male cluster students - all male non-cluster students. 158 cluster/781 non-cluster

	Cluster	Non-cluster	F-value	
Verbal reasoning	43.41	58.75	49.86	***
Numerical ability	40.21	53.91	31.27	***
Abstract reasoning	53.11	64.74	24.60	***
Mechanical reasoning	50.92	56.20	4.86	*
Space relations	52.73	61.34	15.06	***
Spelling	41.28	56.58	39.51	***
Sentence structure	37.14	51.30	45.93	***
Clerical speed	35.94	44.87	14.38	***
GPA	2.03	2.60	104.05	***

* significant ($\underline{P} < .05$)
** significant ($\underline{P} < .01$)
*** significant ($\underline{P} < .001$)

The above findings are from Beaverton School District which might not be representative of all school districts.

Summary

Of the 1890 students compared, 372 were cluster students and 1518 were non-cluster students. The charts illustrate the statistical findings from comparing cluster students with non-cluster students.

V. CONCLUSIONS AND RECOMMENDATIONS

Introduction

This study attempted to compare the ability and achievement of students in career cluster programs with those of non-cluster students. Accurate information of this type can be extremely valuable in guidance, curriculum planning, and teaching in general. The 1890 graduates in 1972 and 1973 from Beaverton School District 48's high schools were classified as cluster or non-cluster students and DAT scores and GPA's were recorded for them.

Comparisons of this data were made between these groups and the results analyzed to determine significance. Cluster students as a group were found to be of lower ability and lower achievement than non-cluster students. Six conclusions were drawn from this study, and five recommendations developed.

Conclusions

1. Students in cluster programs are generally lower in potential ability and academic achievement.

2. There are no significant differences between the DAT scores and GPA's of Health cluster boys and those of non-cluster boys.

3. There is no significant difference between the Office Occupations girls' mean GPA scores and non-cluster girls' GPA scores.

4. There is no significant difference in seven out of eight DAT and GPA mean scores for boys in the Child Care cluster.

5. It appears that students in Mechanics, Construction, and Metals clusters are being channeled into the right clusters as there is no significant difference in the mechanical reasoning and space relations mean DAT scores.

6. The sample size for mechanics cluster girls, construction cluster boys, and food service girls was not large enough to enable the drawing of valid conclusions.

Recommendations

One of the purposes of this study was to provide information which would help in the guidance and placement of students in cluster programs. The results have been given to the counseling departments at the involved schools. It is hoped that the results and the awareness of the situation that does exist will enable counselors to make a realistic assessment so students will be placed in the proper channels.

Another use of this study was to provide information upon which to base future curriculum planning. The departments at the involved schools have the results, and it is hoped they will consider them in developing future and existing programs. One change could be to integrate mathematics in cluster programs to further develop computational skills.

Finally, as the results verified that cluster students as a group are of lower ability and lower achievement, it is hoped that educators in general will consider this when working with future cluster students. Further studies are needed to:

1. Reveal how cluster students are performing in their specific cluster area. The examination of other data not included in this study indicates that students do better in their specific cluster classes.
2. Determine if the addition of new clusters attracts higher ability students.
3. Identify from higher ability and higher achieving students why they are not in cluster areas.
4. Ascertain if the lower ability and lower achieving students are being channeled into new courses added to the school curriculum such as the tenth grade "World of Work" classes.
5. Measure ability and achievement by a means other than reading.

Summary

This comparison of potential ability and academic achievement between cluster and non-cluster students revealed that, as a group, cluster students are lower in both areas. Further conclusions were drawn in more specific areas. From these conclusions a number of recommendations were developed for refining and following up the results of this study.

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APPENDICES

APPENDIX A

Recording Form

Sex	Boy																	
	Girl																	
Clstr. Std.	Yes																	
	No																	
Completed Cluster	D. E.																	
	Health																	
	Mech.																	
	Const.																	
	Metals																	
	Food service																	
	Child Care																	
	Office Occ.																	
DAT Scores	Verbal Reason																	
	Numer. Abil.																	
	Abst. Reason																	
	Mech. Reason																	
	Space Rel.																	
	Spell.																	
	Sent.																	
	Clr. S & A																	
Class Number Grade Minimum Graduation Requirements	Math																	
	Science																	
	9th PE Health																	
	10 PE Health																	
	9th Eng.																	
	10th Eng.																	
	11th Eng.																	
	12th Eng.																	
	11th Hist.																	
	12 Mod. Prob.																	

APPENDIX B

Distributive Education

The distributive education program is designed and organized around the cooperative method. The major emphasis is to prepare high school students vocationally for initial marketing jobs in areas such as: manufacturing, storing, transportation, financing, risk-bearing, wholesaling, retailing, and service.

The program is aimed at students who want, need, and can use the training in retail, wholesale, or service occupations. It is open to junior and senior boys and girls.

The teacher-coordinator is responsible for teaching the classroom phase as well as supervising on-the-job training experiences. The coordinator is allowed released time for supervising the students on the job.

Students are enrolled in a class which meets a minimum of five hours per week. Students' released time for on-the-job training will equal or exceed the time spent in the related class. Credit towards graduation is granted for related classroom work and for on-the-job experience, for both of which the student receives a letter grade.

Health Careers

This program is designed for students wishing to explore the many areas of health occupations. Attention is directed to professional, technical, and business areas of the health field as well as to many skilled and unskilled occupations allied to private and public health programs.

Time is spent introducing the student to the total field of health and medical ethics. The program includes one or more field experiences of the student's choice. Classroom and on-the-job experiences are coordinated by the instructor.

Mechanical

The mechanical cluster is designed to provide the necessary basic education and conceptual skills for development of entry level competencies in the broad field of mechanics, apprenticeship programs, or continuation of an educational program at the post-high school level. This cluster is based upon the study of mechanical, electrical, and fluid systems of technology. Each of these systems is subdivided into inspection-testing, mechanical maintenance, and communications. Inspection-testing is the study of testing and measuring. Mechanical-maintenance is the study of hand and portable power tools, assembly and disassembly, service, cleanup, and final inspection. Communications includes the study of oral, written, and visual calculations as well as blueprint reading. All these areas are approached from the standpoint of how they function within each system.

Food Services

This course is designed to explore all types of food service as well as general knowledge in the development of the skills required for successful employment in the food service industry. For entrance. a student must be a junior or senior with a sincere interest in the food service industry. Learning experiences in food services include: food preparation in the school and community, field trips, panel discussions, guest speakers, demonstrations in food preparation, planning, serving, and preparing banquet luncheons, classroom lectures, and career counseling.

The second year of Food Services is open only to those students who have successfully completed the first year of training. The aim of the second year is to explore in more detail the food service industry as well as participation in on-the-job training in the community. Special attention is given to individual student interest.

Metals

This course is designed to provide understanding of fundamental principles and develop entry level competencies in a family of metals occupations. The course includes development of skills in forming, joining and machining. The properties of metals as they apply to industrial processes are studied. Precision measuring devices, testing devices, and instruments are used throughout the course. Math, science, communication and graphics skills are developed and improved through practical application. The programing and manufacturing of a mass produced product is experienced. Machine and tool maintenance are an integral part of the course. Industrial on-the-job training experience is part of the second year.

Child Care

Child Services is a program designed for students wishing experience in the following areas: (1) understanding child development in the basic growth patterns: socially, emotionally, physically, and intellectually; (2) understanding pre-school education--its purposes, planning, and functioning; (3) performing as an assistant in a child care center and being able to direct individual and group activities; (4) learning about the work opportunities in child services and related fields; (5) preparation for continued study in post-secondary programs. Students enrolled in the Child Care Program meet in weekly seminars.

Construction

The construction program is designed to provide experiences for students interested in any phase of the building trade including engineering and/or skilled craftsmanship. The experience enables the student to: (1) develop and understand the industry and its technology; (2) develop an understanding of career opportunities, requirements and working conditions in the industry; (3) develop pride in accomplishment and good workmanship; (4) gain experience under an organized plan of on-the-job training under actual industrial conditions; (5) prepare for continued study in post-secondary programs and/or enter into his chosen occupational field upon graduation.

The construction cluster for the junior year is designed to provide the necessary basic education and conceptual skills for development of entry level competencies in the broad field of construction, entrance into an apprenticeship program or continuation of an educational program at the post-high school level. The prime subject matter is a study of systems technology. These systems are architectural, structural, mechanical and electrical. The systems technology units are divided into testing and inspection, construction and maintenance, and communications. Inspection-testing deals with the knowledge and skills involved with testing, measuring and inspection of all the systems. Construction and maintenance is the study of tools, assembly and disassembly, site preparation and clean up. Communication includes oral, written, visual, calculations and blueprint reading concentrations. The juniors enrolled in this program spend the first 10-15 weeks working on a house with a local contractor. This "on-the-job" training is correlated with the classroom experiences that make up the remainder of the junior year.

The construction program in the senior year is designed to involve high school senior students in various phases of the building trade industry. Selected students spend 18 weeks working in the building trade and 18 weeks in a regular school program. Students' on-the-job training, evaluation, and work assignments are based upon recommendations of the contractor-employer. Evaluation for school purposes is accomplished through a coordinator.

Office Occupations

This program is designed as a culminating experience for students preparing for entry into the office occupations. Senior students receive five or more hours of related classroom instruction each week through group and independent study. They are released early to go to their jobs. Classroom activities are a combination of group instruction and individual projects which meet the varying needs of the students.

The teacher-coordinator visits the place of employment to confer with the employer and observe the on-job activities of the trainee. Individual conferences with the students are arranged to discuss their progress and to determine a procedure to get maximum value from their training program.

Students must be in the twelfth grade, and have a career objective in the office occupations.

APPENDIX C

Differential Aptitude Test Definition

Verbal Reasoning

The Verbal Reasoning test, as its name implies, is a measure of the ability to understand concepts framed in words. It is aimed at the evaluation of the student's ability to abstract, generalize, and to think constructively rather than at fluency or vocabulary recognition. The analogies form of test item is peculiarly appropriate for the measurement of reasoning ability. The particular type of analogies item devised for this test is especially useful because it provides: (1) a highly reliable item; (2) a very versatile item; and (3) a measure of reasoning that is relatively complex without being tricky or esoteric.

The item type is unusually reliable in that the chances are only 1 in 16 that any correct answer will be guessed; in most multiple-choice test items, the chances are one in four or five. This high reliability of each individual item makes unnecessary the use of a scoring formula which corrects for guessing.

The item type is versatile. Its structure requires real thinking to supply the correct response to each item. At the same time, the content of the items may be varied as much as desired. The words used in these items may come from history, geography, literature, science, or any other content area. The item thus samples the student's knowledge and his ability to abstract and generalize relationships inherent in that knowledge.

The simple analogy has been widely used since its inclusion in the earliest group tests of intelligence. The very extent of its use is testimony to its applicability as a measure of general intelligence. All too often, however, the simple analogy is solved on the basis of association rather than real thinking; furthermore, difficult items are typically obtained by employing rare items of knowledge from subject matter fields, or very unusual vocabulary terms. For the present test, the item type used overcomes both these drawbacks; the vocabulary is for the most part relatively simple and the content is reasonably familiar. The additional complexity, and additional item difficulty where desired, are functions of the reasoning process required (25).

The Verbal Reasoning test may be expected to predict with reasonable accuracy success in fields where complex verbal relationships and concepts are important. Academic success in most fields would certainly come under that classification. In judgments as to whether or not a student is likely "college material," the Verbal Reasoning test score deserves considerable merit. Vocationally, the test also indicates something of the occupational level to which the student may appropriately aspire since there is a positive relationship in many occupations between the level of responsibility of a job and the complexity of verbally phrased ideas to be comprehended.

Numerical Ability

The Numerical Ability items are designed to test understanding of numerical relationships and facility in handling numerical concepts. The problems are framed in the item type usually called "arithmetic reasoning." This was prompted by the desire to avoid the language elements of the usual arithmetic reasoning problem in which reading ability may play a significant role. The computation form has the advantage of not being thus contaminated as a measure of numerical ability.

It is evident from inspection of the items that the measurement of reasoning ability is not sacrificed by the use of the computation type. Some of the items test only for skill in numerical processes; this is necessary information for guidance purposes. Many of the items, however, call for understanding of numerical relationships; though computationally simple, they are, as problems, fully as complex as items usually framed in verbal terms. It was demonstrated by actual tryout in the schools that they are sufficiently complex to challenge students in all high school grades.

The test has been so devised as to require intelligent handling of the concepts. Answers are scored with this principle in mind. For example, in problem 17 of Form A of the test, the answer 47 ft., 24 in. is scored as wrong. Even though it is the correct sum arithmetically, only 49 ft. is accepted. The student who has given the former response has not responded intelligently; he has failed to perceive the relationship in the feet and inches combination. An employer or teacher would look askance at someone who, when asked to measure a table replied, "4 feet, 12 inches." The same approach to evaluation of numerical understanding is applied in this test.

The Numerical Ability test is a measure of the student's ability to reason with numbers, to manipulate numerical relationships and to deal intelligently with quantitative materials. It teams with the Verbal Reasoning test as a measure of general learning ability. Educationally it is important for prediction in such fields as mathematics, physics, chemistry, engineering, and other curricula in which quantitative thinking is essential. Various degrees of numerical ability are required of laboratory assistants, bookkeepers, statisticians, shipping clerks, carpenters, tool makers, and many other professionals dealing with the physical sciences.

Abstract Reasoning

The Abstract Reasoning test is intended as a nonverbal measure of the student's reasoning ability. The series presented in each problem requires the perception of an operating principle in the changing diagrams. In each instance, the student must discover the principle or principles governing the change of the figures and give evidence of his understanding by designating the diagram which should logically follow.

Considerable care was exercised to prevent any visual discrimination factor from distorting the measurements obtained. Many "picture" tests yield ambiguous scores because they require the student to discriminate between lines or areas which differ but slightly in size or shape. The designs used have been developed so that all drawings are large and clear, and so differences between successive diagrams are obvious. No premium is placed on visual acuity. In each case the task is generalizing the changes into the operating principles--thinking with abstract symbols. Complexity is obtained from increasing conceptual difficulty. The differences are apparent; discerning why the patterns differ is the intellectual exercise.

The Abstract Reasoning test supplements the general intelligence aspects of the Verbal and Numerical tests. It involves the ability to perceive relationships in abstract figure patterns--generalization and education of principles from nonlanguage designs. Under ordinary conditions the Abstract score will be relevant when the curriculum, profession, or vocation requires perception of relationships among things rather than among words or numbers. In this sense, it may be as properly grouped with the Space and Mechanical tests as with the Verbal and Numerical. Since the ability to reason with words is not the same as the ability to reason with abstract figures, the Abstract Reasoning cannot substitute for the Verbal Reasoning test. However, it may be valuable as a check on the Verbal score in some cases of known or suspected language handicap. For example, if a student with a foreign background scores low on the Verbal Reasoning test but relatively high when dealing with the abstract figures, the counselor would have good reason to question the validity of the Verbal score for that student.

Space Relations

The item type devised for the Space Relations test represents a combination of two previous approaches to measurement of this ability. The ability to visualize a constructed object from a picture of a pattern has been used frequently in tests of structural visualization. Similarly, the ability to imagine how an object would appear if rotated in various ways has been used effectively in the measurement of space perception. The item type used combines the functions of these previous item types since both factors are considered important in any useful definition of ability to think in spatial terms.

A feature inherent in these items is that they require mental manipulation of objects in three-dimensional space. Item forms which refer to only two dimensions are less useful, since there are relatively few occasions when perception of two-dimensional space alone is important.

As in the Abstract Reasoning test, the patterns and other drawings are large and clear; no premium is placed on visual discrimination. Perception of differences is very easy; the task is concerned solely with judgments of how the objects would look if constructed and rotated. Minute differences in size do not determine the answers. A subject's answers will be correct if he has the ability to imagine the constructed object and its appearance after rotations.

The Space Relations test is a measure of ability to deal with concrete materials through visualization. There are many vocations in which one is required to imagine how an object would look if made from a given pattern, or how a specified object would appear if rotated in a given way. This ability to manipulate things mentally, to create a structure in one's mind from a plan, is what the test is designed to evaluate. It is an ability needed in such fields as drafting, dress, designing, architecture, art, die-making, decoration, or wherever there is need to visualize objects in three dimensions.

Mechanical Reasoning

The Mechanical Reasoning test is essentially a new form of the series of Mechanical Comprehension Tests prepared previously by one of the authors. The name has been altered to minimize confusion between the earlier forms and those used in the Differential Aptitude Tests. Each item consists of a pictorially presented mechanical situation together with a simply worded question. Care was taken to present items in terms of simple, frequently encountered mechanisms that do not resemble textbook illustrations or require special knowledge.

There is reason for considerable confidence in the Mechanical Reasoning test. It was built with the full experience of the Bennett Mechanical Comprehension Tests behind it. The extensive literature reported in recent years has amply demonstrated the usefulness of this approach to reasoning in the mechanical field and the success with which the test measures understanding of mechanical and physical principles in familiar situations. The Mechanical Reasoning test was devised to parallel closely the regular series of Mechanical Comprehension Tests, with some minor changes suggested due to experience with the earlier tests and with forms devised by Bennett for military classification use.

The ability measured by the Mechanical Reasoning test may be regarded as one aspect of intelligence, if intelligence is broadly defined. The person who stands high in this characteristic finds it easy to learn the principles of operation and repair of complex devices. The score is affected by the previous experience of the subject but not to a degree that introduces serious difficulties in interpretation. Formal training in physics produces an increase in score of only a few points.

The test is useful in those curricula and occupations where an appreciation of the principles of common physical forces is required. If a student intending to major in a physical science field, or in technical or manual training courses, does not make a good score on this test, he should expect to find the work difficult. Occupations such as carpentry, mechanics, maintenance, assembly, and hundreds of others in plants and factories require the kind of understanding it measures.

It is important to realize that Mechanical Reasoning scores are of less educational and vocational significance for girls than for boys. The mean scores for girls are lower, the reliability of measurement is poorer, and the value of the test for educational or vocational guidance is less clearly established. If a girl expresses interest in mechanical or engineering work, her score probably will be more meaningful if compared with the scores of boys in her grade rather than with those of girls.

Clerical Speed and Accuracy

The Clerical Speed and Accuracy test is intended to measure speed of response in a simple perceptual task. The student first must select the combination which is marked in the test booklet, then bear it in mind while seeking the same combination in a group of similar combinations on a separate answer sheet and, having found the identical combination, underline it.

The item thus provides a series of situations which approximate the elements involved in many clerical jobs. Several simple tasks in a routine series are involved in each item. Little or no intellectual difficulty is involved, since "intelligence" components are adequately measured by other tests of this battery. In this test the objective is to measure speed of perception, momentary retention, and speed of response.

The item type devised fulfills another requirement not previously satisfied by generally available clerical tests--it is scorable by IBM test scoring machines, like the rest of the Differential Aptitude Tests. This is of great importance wherever large-scale testing programs are in operation.

The Clerical Speed and Accuracy test is designed to measure the student's speed and accuracy with simple number and letter combinations. It is the one test in the entire series which places a heavy premium on speed. As the test is scored, in fact, the student is not additionally penalized for any errors he may make, i.e., his score is the number of items correctly marked--wrongs are not subtracted. This scoring decision was based on research which indicated that errors are rarely made in a task as simple as this one. In one group of 245 eleventh grade students, scoring for rights only and scoring by use of the rights-minus-one-fourth-wrongs formula produced only four scores which differed at all, and these by only one point.

The ability to do routine work of the kind which this test exemplifies is important in filing, coding, stock room work, and similar occupations. It is of relatively little importance for most educational purposes, although pupils whose scores are very low may find it difficult to meet classroom standards of neatness, speed and precision. If a pupil's scores on other tests are high, low Clerical scores should be eyed suspiciously. A low score on this test for a generally superior student is as likely to indicate his emphasis on correctness as it is to indicate lack of ability to work rapidly. Schools typically stress accuracy rather than speed, and properly so; hence it is not surprising that some good students will proceed cautiously on this test despite directions to work rapidly. If Clerical Speed and Accuracy is considered by a counselor to be important for a specific good student whose scores is low, it would be wise to retest him after re-emphasizing the importance of speed. (Forty-two pupils who scored high on the Verbal Reasoning and Numerical Ability tests and low on the Clerical Speed and Accuracy test, were retested after being urged to work rapidly. Their scores all increased appreciably.)

Language Usage: Spelling and Sentences

The item type used in the Spelling section of the Language Usage test is not new. Its chief virtue, as distinguished from similar item types, is its adaptability to machine scoring. The words themselves, however, were chosen with unusual care. All words were selected from the lists in Gates' Spelling Difficulties in 3876 Words. The words were further selected editorially for their prominence in everyday vocabulary. The incorrect spellings chosen were those which the research of Gates and others showed to be the most frequent errors, except when the incorrect spelling was another word correctly spelled (e.g., "spear" as a wrong spelling of "spare").

It is known that many words are not good test items when properly spelled since almost everyone recognizes that they are correct. Special studies (20) of a large number of words resulted in the discovery of enough words for the test which were effective items when correctly spelled. Every item in the test is thus contributing its appropriate share of measurement; there is no padding. This fact enhances the reliability of the spelling test.

The Sentences section of the Language Usage test is intended to measure the student's ability to distinguish between good and bad grammar, punctuation and word usage. The item form devised for this test has the unusual advantage of providing five potential items in each sentence; that is, 250 item responses in all for each form of the test. The student must inspect each part of each sentence and judge whether or not it is correct. Since there may be any number of errors in each sentence, the student cannot guess by eliminating parts of the sentence. He must react separately to each part of each sentence.

The Language Usage tests, Spelling and Sentences, are more nearly achievement tests than any of the others. The chief reason for their inclusion among the Differential Aptitude Tests is that they represent basic skills which are necessary in so many vocational pursuits. Separate scores are reported for the two tests even though there are few instances when one of these abilities is needed without the other. The decision to report separate scores is based on experimental research which demonstrated that Spelling and Sentences were not so highly correlated as to make separate scores meaningless--that is, the student who scores high on Spelling might or might not do well with the Sentences test. Taken together they provide a good estimate of a student's ability to distinguish correct from incorrect English usage. This is an ability necessary in stenography and other aspects of business correspondence in journalism, proofreading, and advertising--wherever the written language is stock in trade. Students with high Verbal Reasoning and low Language Usage scores can probably be helped by remedial training.

In the above paragraphs, various callings have been indicated in which the abilities measured by the individual tests are necessary or useful. The sophisticated counselor will not be misled by this oversimplification. The identification of a few occupations or a single curriculum with a single test is used in this chapter only for illustration. For almost any occupation, more than one of the abilities measured by the Differential Aptitude Tests probably will be significant. In any real counseling situation the complete pattern will need to be considered in its entirety, together with all other relevent information.