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ABSTRACT

The document on occupational clusters was developed from papers presented in staff seminars in the Bureau of Occupational and Adult Education and contains eight papers: Introduction to the World of Clustering, Sidney C. High; Cluster Curriculum Development, Elizabeth J. Simpson; the Cluster Concept, Development of Curricular Materials for the Public Service Occupations Cluster, Patrick J. Weagraff; Occupational Career Clusters--the Oregon Way, Leonard Kunzman; Occupational Clusters and Secondary to Postsecondary Articulation, Beryl McKinnerney; International Perspectives on Clustering, Gordon I. Swanson; the Manpower Education Effort in Clustering, Ann Donovan; and Career Education--Career Clusters--Explanations, Concepts and Office of Education Occupational Education Codes, Sherrill D. McMillen. The document includes the following appended materials: a 71-item "Introduction to Clustering" reference list; related charts, models, and tables; and an 18-page career cluster taxonomy. (JR)

A Report —

SEMINARS ON OCCUPATIONAL CLUSTERS

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U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
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INTRODUCTION

With the advent of the career education movement, the Office of Education set about to develop a plan for classifying the 20,000 job titles identified by the Department of Labor in the Dictionary of Occupational Titles into a usable educational scheme. Such a scheme was to serve as the basis for bringing about greater emphasis on the real world of work in the educational setting and to provide an administratively feasible plan for the implementation of career education activities.

Program specialists and leaders in vocational and technical education were called together and asked to develop a plan whereby all occupations could be grouped into a few major categories. As a result, a working paper which identified 15 career cluster areas was produced by the Division of Vocational and Technical Education. These 15 clusters were then used for curriculum development and program planning purposes at Federal and State levels. After about two years of actual experiences in working with the clusters a review of the original cluster scheme was made to see if it was realistic and if modifications were needed. A second working paper was then prepared by the Division of Vocational and Technical Education in cooperation with representatives from the Census Bureau and from the Department of Labor.

In the spring of 1974, the question of clustering was again addressed by staff in the Bureau of Occupational and Adult Education. Recognizing that there were several bases for arranging occupations into clusters of economic activity, the Deputy Commissioner for Occupational and Adult Education asked Dr. Elizabeth J. Simpson to arrange for a series of seminars for Bureau staff for the purpose of re-examining national leadership roles and needs in clustering in occupational education. Key personnel and State leaders were invited to share their views and experiences, and the eight papers presented during the seminars have been gathered in this monograph.

This document is being made available to key State vocational and career educators as well as to staff of the Bureau of Occupational and Adult Education. It is designed for use in continuing discussions of the cluster concept and as a thought-stimulator for planning improved career development and vocational preparation programs.

The monograph was assembled in the Curriculum Development Branch of the Division of Research and Demonstration. Ms. Mary F. Wingrove was coordinator for its preparation.

Howard F. Hjelm
Director, Division of Research
and Demonstration

AN INTRODUCTION TO CLUSTERING

Sidney C. High, Jr.

Director, Division of Career Education
U.S. Office of Education

The subject of clustering is a complex one. Its complexity is reflected in a growing body of literature, much of which is cited in the reference list at the end of this paper. It would be impossible, in a short paper of this type, to treat the subject in an exhaustive manner. Rather, the attempt here will be to provide an introduction to and a broad overview of the general topical area of clustering. It might be said that this topical area has both a time dimension and a space dimension. It is interesting to look first along the time dimension.

One of the earliest references to the cluster concept is found in a 1930 document by Dr. Charles A. Prosser, who is regarded as the father of the Smith-Hughes Act of 1917 and the founder of the initial federal vocational education program in the United States. During the period from January to May of 1930, under a project funded by the Rockefeller Foundation, Dr. Prosser conducted a study of vocational education in the Philippine Islands and prepared a report, with recommendations for further development and improvement of the Philippine vocational education program. In this report, Dr. Prosser stated:

> There is a demand in every province which is constantly growing for workmen who can use modern tools and processes, up to an elementary standard, in both wood and metal. In addition there is a slowly increasing demand for workmen who can care for, adjust, repair and operate gas engines, automobiles and trucks; and a correspondingly slowly increasing demand for workmen who, in addition to an elementary knowledge of gas engines, can install and operate and make minor repairs on electrical equipment. . . .The nature of most of the work to be done requires a handy mechanic. To put the matter another way, the provinces need general mechanics and not special tradesmen. As distinguished from the highly competent mechanic in any trade, the handyman can do a number of things in a number of lines.[1]

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[1]Prosser, C.A. A General Report on Vocational Education in the Philippine Islands. Manila: 1930. Page 51.

Dr. Prosser went on to recommend that the trade schools in the Philippines should offer three types of programs:

1. Building construction, including carpentry, concrete work, painting and plumbing.

2. Metalworking, including blacksmithing, welding, sheet metal work, and simple lathe, drill press, and benchwork.

3. Repair and operation of automobiles and gasoline engines; and electrical work, including housewiring and installation and minor repair of electrical equipment.

Although he did not use the term "clustering," Dr. Prosser seems, in his pragmatic way, to have hit upon an early approach to the cluster concept.

About two decades later, at the Asian Technical Manpower Conference in Bangkok in 1951, the cluster concept emerged again. Officials of the International Labour Organization maintained that trade training in Southeast Asia "must be more polyvalent, i.e., less narrowly specialized, than in Europe and other highly industrialized countries."[2] They called for the training of "polyvalent" workers; workers who could relate to a number of jobs in a family of occupations.

Still another decade later, in the United States, the Panel of Consultants on Vocational Education appointed by President John F. Kennedy, issued a report entitled Education for A Changing World of Work. The report, published in 1963, contained the following recommendations:

> Basic vocational education programs should be designed to provide education in skills and concepts common to clusters of closely related occupations. The curriculum should be derived from analyses of the common features of the occupations included. These students should receive specialized or more advanced vocational training later in post-high-school programs, apprenticeship, or on-the-job experiences.[3]

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[2]International Labour Organization. Asian Technical Manpower Conference. AMC/I/3/3. Bangkok: December 1951. Page 6.

[3]Panel of Consultants on Vocational Education. Education For a Changing World of Work: Report Prepared at the Request of the President of the United States. Washington, D.C.: Government Printing Office; 1963 (ED-019-500). Page 227.

Five years later, the Advisory Council on Vocational Education, appointed by the Secretary of HEW, said in its 1968 report that programs of occupational education should include:

> Programs designed to acquaint students with employment opportunities and to teach skill and knowledge required in one or more industries or families of occupations certified by the U.S. Department of Labor as offering expanding opportunities for employment.[4]

The Advisory Council on Vocational Education went on to suggest certain desirable characteristics of a vocational-developmental curriculum:

> Occupational preparation should begin in the elementary schools with a realistic picture of the world of work. Its fundamental purposes should be to familiarize the student with his world and to provide him with the intellectual tools and rational habits of thought to play a satisfying role in it.
>
> In junior high school, economic orientation and occupational preparation should reach a more sophisticated stage with study by all students of the economic and industrial systems by which goods and services are produced and distributed. The objective should be exposure to the full range of occupational choices which will be available at a later point and full knowledge of the relative advantages and the requirements of each.
>
> Occupational preparation should become more specific in the high school, though preparation should not be limited to a specific occupation. Given the uncertainties of a changing economy and the limited experiences upon which vocational choices must be made, instruction should not be overly narrow but should be built around significant groupings of occupations or industries which promise expanding opportunities. All students outside the college preparatory curriculum should acquire an entry level job skill, but they should also be prepared for post-high school vocational and technical education. Even those in the college preparatory curriculum might profit from the techniques of

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[4]Advisory Council on Vocational Education. Vocational Education; The Bridge Between Man and His Work: General Report. Washington, D.C.: Government Printing Office; 1968 (ED-028-267). Page 198.

"learning by doing." On the other hand, care should be taken that pursuit of a vocationally oriented curriculum in the high school does not block the upward progress of the competent student who later decides to pursue a college degree.

Occupational education should be based on a spiral curriculum which treats concepts at higher and higher levels of complexity as the student moves through the program. Vocational preparation should be used to make general education concrete and understandable; general education should point up the vocational implications of all education. Curriculum materials should be prepared for both general and vocational education to emphasize these relationships.[5]

During the decade of the 1960's, a number of systematic efforts were made to apply the cluster concept to curriculum development in a variety of occupational areas. An early effort was one reported by Schill and Arnold in 1965. In this study, Schill and Arnold determined the knowledges needed by technicians in six technologies: electronic, electro-mechanical, mechanical, chemical-mechanical, chemical, and electro-chemical. They established the existence of a core of knowledge common to all six of the technologies.

In addition, they determined that certain knowledges were common to two or three of the technologies while some knowledges were specific to only one technology. Schill and Arnold's findings are illustrated in Figure 1, which is taken from their 1965 report.[6]

During the period from 1965 to 1969, Dr. Donald A. Maley of the University of Maryland conducted a project to develop, implement, and test the cluster concept at the secondary school level in three clusters of occupations: a construction cluster, a metal forming and fabrication cluster, and an electro-mechanical installation and repair cluster.

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[5]Advisory Council on Vocational Education. Vocational Education; The Bridge Between Man and His Work: Highlights and Recommendations from the General Report. Washington, D.C.: U.S. Office of Education; 1968 (ED-014-619). Page 74.

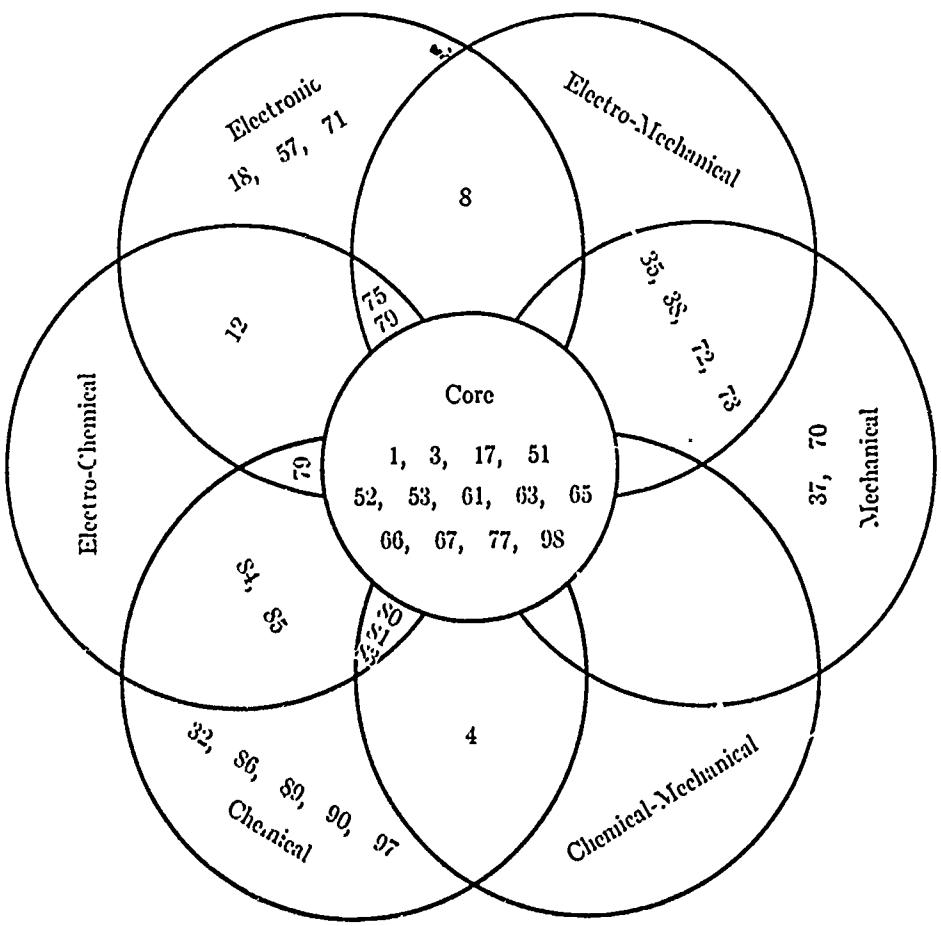
[6]Schill, William J. and Joseph P. Arnold. Curricula Content for Six Technologies. Urbana, Illinois: University of Illinois; 1965 (ED-045-860/VT-002-679). Page 83.

Figure 1

The Core Program and Overlapping Knowledge

The following schematic presents the core program and the specific programs for each of the technologies in pictorial form, using the card number from the card sort to identify the knowledge. Data processing, although included in the general core, is not represented in the specific recommendations because of an insufficient number of respondents in that category.

Schematic Representation of General and Specific Knowledges Related to Six Technologies



(It is interesting to note that Dr. Maley's three clusters are almost identical with the clusters recommended by Dr. Prosser in 1930.) Dr. Maley's work has been carefully documented in a series of detailed reports which will be found as entries No. 12 through No. 17 in the reference list at the end of this paper.

Concurrently with Dr. Maley's work at the University of Maryland, Professor Gordon McCloskey was directing a series of clustering efforts at Washington State University. The studies directed by Professor McCloskey dealt with eight clusters of occupations: food service work, merchandising in retail establishments, office work, child care occupations, allied health occupations, building trades, electronics technology, and agricultural production (including grain, dairy, forestry, livestock, poultry, horticulture, and general farming). Reports of these studies will be found as entries No. 28 through No. 36 in the reference list at the end of this paper.

A detailed and interesting study of a "sub-cluster" was conducted between 1965 and 1970 by Dr. David Allen of UCLA. In this study, Dr. Allen was concerned with the development of training programs for aviation mechanics in three categories: those who work for airlines, those who work for large general aviation companies and those who work for small general aviation companies. A nationwide survey revealed that 70 percent of the training requirements were common across all three of these types of mechanics, making possible the development of a core curriculum for the aviation mechanics occupation. (See entry No. 24 in the reference list.)

Another project in the late 1960's dealt with career ladders and core curriculum for the training of paraprofessionals in a cluster of human services occupations. (See entries No. 26 and No. 27 in the reference list.)

Still another project during this same time period was one conducted at UCLA dealing with core curriculums for various clusters within the allied health occupations. (See entries No. 25, No. 44, No. 45, and No. 68 in the reference list.)

Moving out of the university setting and into the operational realm of a State education agency, the cluster concept became a subject of developmental work by the Oregon State Board of Education at the end of the 1960's. By 1971, the State of Oregon had issued curriculum guides for secondary school programs in the metalworking occupations cluster, the marketing occupations cluster, the agricultural occupations cluster, the food service occupations cluster, the clerical occupations cluster, and the electricity-electronics occupations

cluster. (See entries No. 18 through No. 23 in the reference list.)

It should be made clear that this discussion has traced the emergence of the cluster concept in relation to curriculum development. It should be pointed out, however, that the cluster concept has also emerged in sociological-psychological arenas where the bases and purposes for clustering are different. Some of these approaches to clustering are typified by the work of John Holland, Anne Roe, and Donald Super. (See entries No. 60, No. 61, and No. 62 in the reference list.) Work of this type, which adds other dimensions to the clustering process, began in the early 1950's and extended into the 1970's.

The slowly-developing, exploratory efforts in clustering were brought into sharp focus during the school year 1970-71. During this school year, the "career education" concept suddenly crystallized and achieved national prominence as a high priority educational goal.[7] As program designers and curriculum developers attempted to make plans for bringing the career education concept into operation in actual school settings, the need for some way to group the many occupations in the world of work into meaningful and manageable clusters became imperative.

The career education concept called for the development of educational programs which would enable students to become aware of the full range of career options available in the world of work, to explore possible types of career areas in which they might be interested, and to prepare for, enter, and progress in careers of their choice. Since the "world of work" in the United States involves literally thousands of kinds of occupations, approaching that "world of work" on an occupation-by-occupation basis is an impossibility in terms of educational program development. It is necessary to group the occupations in some systematic way that will be understandable to students, to teachers, and to the community at large.

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[7]Marland, Sidney P. Career Education Now. (Speech delivered before the National Association of Secondary School Principals on January 23, 1971.) (ED-048-480)

[7]High, Sidney C. "A National Perspective on Career Education." Journal of Research and Development in Education, Spring 1974, Volume 7, Number 3, pp. 3-17.

The clustering efforts which had taken place prior to 1971 had dealt with selected segments of the world of work and had established the feasibility of the clustering of occupations for curriculum development purposes. However, none of them had addressed the problem of systematically dividing the entire world of work into an array of clusters which would encompass all occupations in the United States.

The first bold attempt to undertake this formidable task was initiated during the school year 1970-71 by the Division of Vocational and Technical Education of the U.S. Office of Education, under the leadership of Dr. Arthur Lee Hardwick who, at that time, was Associate Commissioner for Adult, Vocational, and Technical Education. As an initial step, Dr. Hardwick convened a meeting in Dallas, Texas to develop an overall framework for a comprehensive cluster system. Participants in the meeting included four State directors of vocational education (Wesley P. Smith of California, M.G. Linson of Colorado, Thomas S. Derveloy of Louisiana, and Francis Tuttle of Oklahoma), two Regional Officers of the U.S. Office of Education (Kent Bennion of the San Francisco Regional Office and C.R. Eddins of the Dallas Regional Office), a representative of the American Vocational Association (Mary Allen), and three members of the USOE Division of Vocational and Technical Education (Edwin Rumpf, Frank Briley, and Sidney High), with Dr. Hardwick serving as chairman. In a two day meeting, taking into account the previous research and development work in clustering as well as practical administrative considerations, this group produced the framework for what was to become a USOE cluster scheme of 15 clusters.

During the spring of 1971, staff committees of the Division of Vocational and Technical Education, coordinated by Michael Russo, set about the task of refining the cluster structure and blocking out the content of each cluster. The results of this work, in the form of a series of draft charts covering each of the 15 clusters, were shared with the fifty State directors of vocational education during their annual meeting in Washington in May of 1971. On the basis of comments received from local, State, and university personnel over the next several months, the draft charts for the various clusters were modified and refined. In January of 1972, the Division of Vocational and Technical Education issued a working paper on the 15 "career clusters," which provided the basis for substantial USOE efforts in cluster curriculum development (See Appendix A).

During the past three years USOE has awarded a series of contracts for curriculum development work in various clusters. These contracts were supported with funds appropriated under Part I (Curriculum Development) of the Vocational Education Amendments of 1968. By the end of fiscal year 1974, more than $9 million had been invested in these cluster curriculum development efforts, and some work was underway in each of the 15 clusters.

The cluster scheme developed by the USOE Division of Vocational and Technical Education was not the only effort. A similar effort to delineate the world of work in a series of systematic clusters was undertaken by research and development personnel. Under this effort, the Human Resources Research Organization (HumRRO) was contracted to develop an "occupational clustering system" for use by participants in a project for the development of a school - based comprehensive career education model (CCEM) during 1972 and 1973. These participants consisted of the Center for Vocational Education at Ohio State University and the public school systems in Hackensack, New Jersey; Atlanta, Georgia; Pontiac, Michigan; Jefferson County, Colorado; Mesa, Arizona; and Los Angeles, California.

The "occupational clustering system" developed by HumRRO consisted of 12 clusters: (1) public service, (2) transportation, (3) manufacture, (4) natural resources-production, (5) natural resources-control, (6) commerce, finance and distribution, (7) communication and media, (8) construction, (9) recreation, (10) arts and humanities, (11) health and welfare, and (12) education and research. (See entry number 11 in the reference list) and served as a framework for the model developers.

In the meantime, the Oregon State Board of Education continued to expand its clustering efforts, and by 1974 had produced a total of 13 cluster curriculum guides for use in public schools in Oregon. Two large city school districts was taking place also in other important cluster activity.

The first was Dallas, Texas which, in organizing the program for its massive and ultra-modern "Skyline Career Center," developed a cluster scheme consisting of 28 clusters. The Dallas School System contracted with RCA for assistance in developing curriculum materials for the various clusters. It has been reported that Dallas is arranging to have these cluster curriculum materials published through Harper & Row Company, for release in 1975.

The San Diego City School System has developed a cluster scheme consisting of 12 clusters. These clusters, around which San Diego's career education program is organized, are listed below. Also shown for each cluster is the percentage of persons employed in

San Diego County who work in that particular cluster.

Agriculture and Ecological Studies Cluster	3.5%
Business and Office Occupations Cluster	25.0
Communications and Media Occupations Cluster	3.1
Community and Personal Services Occupations Cluster	9.3
Consumer and Homemaking Related Occupations	3.4
Fine Arts and Humanities Cluster	0.7
Health Occupations Cluster	5.3
Industrial and Construction Occupations Cluster	22.0
Marketing and Distribution Occupations Cluster	9.6
Public Service Occupations Cluster	10.4
Science and Engineering Occupations Cluster	3.8
Transportation Occupations Cluster	3.9
Total	100.0%

It can be seen along the time dimension 1930 through 1974 that the idea of clustering emerged slowly, gathered momentum in the decade of the 1960's, and became the subject of large scale developmental efforts in connection with the career education movement which got underway in the early 1970's. Turning now to the space dimension, it is interesting to look at the geographic spread of the cluster concept.

Some of the cluster schemes which have been proposed have exhibited little if any geographic spread. For example, the 13 clusters developed by the Oregon State Board of Education were designed specifically for use in Oregon and have not spread appreciably beyond the public schools of that State. The 12-cluster scheme developed in San Diego was developed in Dallas has not yet spread to other school systems, but might do so to some extent in the future, when the Dallas cluster curriculum materials become available through a commercial publisher.

The 12-cluster scheme developed by HumRRO for use in the comprehensive career Education Model has, for the most part, been confined to the six local school districts which cooperated with the Ohio State University in the CCEM project. Its adoption by other school districts has, so far, been very limited, but might increase somewhat when the CCEM curriculum materials become available to the public.

On the other hand, the 15-cluster scheme proposed by the Division of Vocational and Technical Education of the U.S. Office of Education has enjoyed a wide geographic spread. The Texas Education Agency has taken the lead in further elaborating and refining the 15 clusters. They have issued two publications to help curriculum developers and local school personnel in applying the 15-cluster scheme to school programs. (See entries number 8 and number 59 in the reference list.) As a result, many of the pilot career education projects in local school districts in Texas have developed programs and instructional materials around the 15 clusters.

The Texas publications have been used not only in the State of Texas, but also in other States. For example, the publication An Analysis of Fifteen Occupational Clusters (entry number 8 in the reference list) has been announced and made available on microfiche to the local school districts in the State of New Jersey by the Curriculum Coordination Center of the State Department of Education. The same publication has been used by the New York State Education Department as the basis for categorizing career education resource materials which local school districts might wish to use in presenting career information to students. (See entry number 71 in the reference list.)

For the past three years, the Tennessee State Department of Education has been developing an articulated, State-wide occupational information program to serve students in the public schools (Project INFOE). One component of this project, designated as Elementary INFOE (Information Needed for Occupational Exploration), is designed to help 4th, 5th, and 6th grade students to explore the broad world of work. The key to Elementary INFOE is the INFOSCRIPT, a cartoon career brief reproduced on a microfilm aperture card. Twenty INFOSCRIPTS have been developed for each cluster provides an overview of the cluster and 19 scripts contain general information on specific job titles within the cluster. The Elementary INFOE Kit consists of a teachers guide, 500 microfilm aperture cards, and 75 overhead transparencies, all organized around the USOE cluster scheme.

The State of Arizona has used the 15-cluster scheme proposed by USOE as a framework for extensive and well-organized State-wide career education efforts conducted with special funding provided by the State legislature. The Public Schools of the District of Columbia have developed an extensive series of curriculum guides for use in exploratory programs at the 7th and 8th grade levels, using as a framework a USOE-type center scheme.

Several significant career education pilot projects in the State of California have made use of the 15 USOE clusters. These include projects in the school districts of Santa Barbara, Covina Valley, and Santa Ana. The clusters have also been widely used in local school districts in Florida, Minnesota, and Oklahoma.

In Virginia, the Arlington Public School System produced a set of career information films, with one film relating to each of the 15 clusters. These films, which were originally used on educational television in the Arlington area, are now being marketed through the Encyclopedia Britannica Educational Corporation.

Under a curriculum contract with the U.S. Office of Education, the Sutherland Learning Associates of Los Angeles Produced a series of 16 animated films to develop the career awareness of three to six year old children. The series, called "The Kingdom of Could Be You," begins with an introductory film and then moves through a separate film on each of the 15 USOE clusters. These films were shown nationwide on the CBS-TV "Captain Kangaroo" children's television series during the spring of 1973, and were repeated during the fall of 1973. The films, which can be used in pre-school as well as kindergarten and first grade programs and which are accompanied by teachers guides, are now available to the public through the Enclopedia Britannica Educational Corporation.

In another mass media approach, the 15 clusters were featured in the "Mini Page", a syndicated 4-page insert for children which appears in Sunday newspapers all over the country and which reaches millions of readers. An entire issue of the "Mini Page" in August of 1973 focused on career awareness for children and included career information, puzzles, and games built around the USOE cluster scheme.

King Features of New York has developed a series of 15 "career awareness" comic books featuring the popular cartoon character "Popeye." One of these comic books is devoted to each of the USOE clusters. The comic books, which are marketed in sets in colorful racks, have been very popular and are now reported to be in use in more than 20,000 school buildings throughout the country.

Lothrop, Lee, & Shepard Company of New York has published a series of 16 books entitled "Exploring Careers." These books are designed for middle school through adult use. The first book, entitled "Your Aptitudes," discusses the importance of analyzing one's natural abilities in order to choose a career wisely. The remainder of the series consists of one book on each of the 15 USOE clusters.

Houghton Mifflin Company of Boston has produced a set of color filmstrips/cassettes entitled "Livelihoods: Careers for Your Life Style." The set consists of an introductory filmstrip/cassette which provides an overview, and 15 separate filmstrips/cassettes representing the USOE clusters. The set is accompanied by a users guide written by Dr. S. Norman Feingold.

Educational Properties Incorporated of Irvine, California, is distributing a sound filmstrip entitled "Career Clusters and the World of Work." This color filmstrip, which consists of 100 frames and runs for 30 minutes, introduces students to the 15 career clusters. It was designed by Dr. Edwin A. Whitfield of the San Diego County Schools.

Counselor Films Incorporated of Philadelphia has produced a series of 15 ten-minute color films, each on a different USOE cluster. The series is entitled "When You Grow Up."

These films, which were designed to increase the career awareness of elementary school students, are being marketed in 16mm, super-8mm, and videocassette forms.

Film Forum Incorporated of Irvine, California, is marketing a series of films entitled "The Working Worlds." These films, in color and sound, are designed for use with upper elementary through high school students. Each film is 13 minutes in length. This series represents a blend of the USOE cluster approach with the approach utilized in the Department of Labor's Occupational Outlook Handbook.

ACI Films of New York is offering both films and filmstrips for introducing elementary school students to the working community. These films and filmstrips, under the title "When I Grow Up I Can Be," emphasize the career clusters identified by USOE.

The H. Wilson Company of South Holland, Illinois, has produced a series of 8 cassettes entitled "Career Clusters: An Introduction to Related Occupations" for use with students in grades 7 through 9. These cassettes are designed to introduce the 15 USOE clusters to junior high school students and to help the students explore the fundamental function of each cluster of occupations. These and other commercially produced materials, which are advertised and marketed through commercial channels, have contributed greatly to the spread of the USOE cluster scheme to school districts throughout the country.

It is apparent, then, that the 15 cluster scheme proposed by the Division of Vocational and Technical Education of the U.S. Office of Education has enjoyed a very wide geographic spread during the past two or three years. When other States and local districts, such as Oregon and Dallas, which have developed and utilized cluster schemes of their own, are added to cluster users it can be seen that the cluster

concept as a whole has exhibited a remarkable geographic spread over a relatively short period of time.

This overview of the topic of clustering, looking both along the time dimension and the space dimension has indicated that the cluster concept has now become a reality in many areas of the curriculum, at various grade levels, in increasing numbers of school districts throughout the United States.

In looking ahead to the future of the cluster concept, one might speculate that the next developmental stages will witness increasing attempts to merge various cluster schemes which have been related to curriculum development with other cluster schemes which have proved valuable in the process of counseling with individual students and in furthering the students' career development.

In fact, each of these commonly used clustering schemes, seems to be particularly desirable from one standpoint and relatively lacking in value from other standpoints. It seems likely therefore that future developments in clustering will see the linking together of two or more cluster schemes into a multi-dimensional matrix which will provide optimum utility for program development, curriculum planning, and counseling purposes. But this is a portion of the topic of clustering which will have to be written after the remaining years of this decade have unfolded.

An Introduction to Clustering

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APPENDIX A

CAREER CLUSTERS*

An Organizational Technique to Facilitate the Delivery of Career Education

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; he is helped to develop his own self-awareness, to become congnizant 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, he 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.

He is then in a position to make a rational choice of an appropriate career goal, Needless to say, 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.

*Prepared by the staff of the Division of Vocational and Technical Education, January 1972.

Once a student has established for himself a tentative career goal, he is helped to plan an appropriate educational path to that goal, and he 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 twenty thousand 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 twenty thousand 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
Agri-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

The attached charts represent a "first cut" at blocking out the scope of each cluster. Each of the 15 career clusters has been sub-divided into a number of sub-clusters, which have been further "shredded out" into more discrete functions at increasing levels of specificity. The charts are still in draft form and will require considerable refinement, but they will serve to illustrate the nature and content of each of the clusters.

(Editor's note: Because of space limitations, the 15 cluster charts are not reproduced here; however, they are available in their entirety in the ERIC System under the accession number ED-069-922.)

ERRATA SHEET

The following changes should be made in the preceding paper entitled "An Introduction to Clustering."

Page 10, third paragraph:

The last sentence of the third paragraph should be changed to read as follows:

"(See entry number 11 in the reference list). This 12-cluster system served as a framework for the CCEM model developers."

Page 10, fourth paragraph:

The last sentence of the fourth paragraph should be changed to read as follows:

"Two large city school districts developed cluster schemes of their own."

Page 11, last sentence:

The last sentence on page 11 should be changed to read as follows:

"The 12-cluster scheme developed in San Diego was designed for use in the San Diego City Schools and no particular efforts have been made to spread it to other school districts. The 28-cluster scheme developed in Dallas has not yet spread to other school systems, but might do so to some extent in the future, when the Dallas cluster curriculum materials become available through a commercial publisher."

Page 12, fourth paragraph:

The last half of the fourth paragraph should be changed to read as follows:

"Twenty INFOSCRIPTS have been developed for each of the 15 USOE career clusters. One INFOSCRIPT for each cluster provides an overview of the cluster and 19 scripts contain general information on specific job titles within the cluster. The Elementary INFOE Kit consists of a teacher's guide, 500 microfilm aperture cards, and 75 overhead transparencies, all organized around the USOE cluster scheme."

Page 12, last line:

The last line on page 12 should be changed to read as follows:

"...a USOE-type cluster scheme."

CLUSTER CURRICULUM DEVELOPMENT

Part I, Vocational Education Amendments of 1968

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Curriculum development in 15 occupational clusters identified for vocational and technical education, was initiated in fiscal '71. By 1974, all 15 clusters had been addressed with the major objective of the development of transportable curriculum guides for occupational exploration and preparation for entry occupations or for further occupational training in the cluster. The following table presents the distribution of Part I funds by occupational clusters, fiscal '71-'74.

DISTRIBUTION OF PART I FUNDS BY OCCUPATIONAL CLUSTERS, '71-'74

CLUSTERS	FY 1971	FY 1972	FY 1973	FY 1974
Agribusiness & Natural Resources	$149,913	$ 260,000	$ -0-	$ 94,332
Business and Office	200,000	-0-	520,314	-0-
Communications & Media	570,000	-0-	241,830	-0-
Construction	150,000	71,705	262,786	-0-
Consumer and Homemaking Education	164,383	195,724	162,144	-0-
Environment	296,236	-0-	-0-	-0-
Fine Arts & Humanities	-0-	-0-	26,109	277,588
Health	-0-	200,000.	500,000	-0-
Home Economics	-0-	-0-	-0-	576,280
Hospitality & Recreation	103,012	-0-	-0-	277,226
Manufacturing	150,000	-0-	250,000	-0-
Marine Sciences	-0-	-0-	-0-	100,383
Marketing & Distribution	-0-	24,000	189,853	-0-
Personal Services	200,000	-0-	-0-	249,945
Public Services	150,000	-0-	229,707	499,778
Transportation	150,000	49,396	250,000	-0-
General Career Education	-0-	1,137,661	273,729	915,441

* (At the time of presentation, Dr. Simpson was the Chief, Curriculum Development Branch, U.S. Office of Education).

Following are descriptions of the major occupational cluster curriculum projects funded under Part I. These efforts are resulting in curriculum materials which will help to achieve the ideal of a marketable skill for each high school graduate, as well as provide a solid foundation for further occupational preparation.

AGRIBUSINESS

The curriculum project in Agri-business, Natural Resources, and Environmental Protection is designed to facilitate the processes of career education at the various stages of career awareness, orientation, exploration and preparation. Personnel from three universities, State staff member, and 32 teachers have been involved in the development of this project. Field testing of the guide is currently underway. Major tasks include:

1. To identify the major agri-business, natural resources and environmental protection occupations;

2. To determine the state-of-the-art in this curriculum cluster;

3. To develop and validate curriculum guides; and

4. To print and disseminate copies of the guides to each of the 50 States.

BUSINESS AND OFFICE

Due for completion in 1975 is a project to develop and validate curriculum guides to comprise an instructional system for teacher use in career development and preparation in business and office occupations, K-14. These guides, adaptable for use throughout the country, cover occupational awareness, orientation, and vocational preparation. Following a period of review and revision of existing materials and the preparation of curriculum modules, field tests began in four States. After the results of the field tests have been gathered and further revision, the project will set up a dissemination conference for State consultants for the business and office occupations.

COMMUNICATIONS AND MEDIA

One of the first occupational cluster curriculum projects undertaken was in the Communications and Media Cluster. The major purpose is the development of curriculum guidelines for the exploration and preparation levels in the cluster. The project was extended to permit field testing of the materials under development, as well as initial development of materials for the orientation level. Upon completion these efforts will result in a related set of career education orientation, exploration and preparation learning activities available for publication and dissemination through the Government Printing Office.

HEALTH

The Allied Health Professions Curriculum Project which covers both secondary and postsecondary levels is concerned with the development of curricula for 26 different allied health occupations. Task inventories were completed for all 26 occupations, occupational analyses on a national basis were completed for 16 occupations, and curricula and instructional materials were either completed or partially completed for seven programs. The greatest impact has been in nursing, medical records, clinical laboratory, prosthethics-orthotics, dental hygiene, and the Secondary Schools Allied Health Occupations.

The basic nursing curriculum had been adopted by approximately 350 nursing education programs nationwide as of July, 1973. As of March, 1974, this figure is estimated to have doubled. Similar impact has occurred in medical records, clinical laboratory, dental hygiene, and the secondary school programs.

HOSPITALITY, RECREATION, AND TOURISM

The primary purpose of this project was to develop comprehensive teacher-oriented curriculum guidelines for leisure occupations at the exploration and preparation levels of the career education model. The final products comprise printed guides for use by teachers in integrating career education for leisure occupations in curriculum at grades 9 through 12. Since the field of recreation and tourism may have inherent employment attractions for the disadvantaged, handicapped and other minorities, motivation factors causing people to enter, continue to leave this occupational area have been assessed in a pilot study.

Dissemination of the guides has included 500 copies to the States; 4,000 copies to local education agencies; and 500 copies to colleges and universities. In fiscal '74, a second major project was funded for further work in the Hospitality, Recreation and Tourism cluster.

CONSUMER AND HOMEMAKING

The development of flexible teaching curriculum modules on consumer education, which can be adapted by teachers to serve a variety of learners of varying ages, socioeconomic levels, cultural backgrounds, and life styles was funded in fiscal '72. The following objectives were achieved by this project:

1. Identification and review of available curriculum materials in consumer education and a determination of gaps in the materials;

2. The development of teaching modules to supplement existing materials;

3. Field testing of modules;

4. Design and development of consumer education teaching modules which can be used by or adapted by teachers or leaders of youth organizations, teachers of pre and in-service teachers of grades 9-14 or adults, and students of any age for self-instruction; and

5. Dissemination of the curriculum modules for use in vocational-technical education programs.

More than 300 home economics, business and office, and distributive education teachers participating in the field test with some 15,000 students from a variety of socioeconomic levels and cultural backgrounds. Testing included schools and non-school learning centers and involved students in grades 9-14; adults, senior citizens, and vocational youth groups. This project resulted in a set of consumer education teaching modules, which have been printed by the Government Printing Office.

In fiscal year '74, a contract was awarded for the development of ungraded curriculum guides for home economics-related occupations in the areas of: 1) child development, family relations, and homemaker/home-health occupations, 2) clothing and textiles occupations, 3) foods and nutrition occupations, 4) home management and family economics occupations, and 5) core of knowledges and skills associated with home economics-related occupations. In this cluster also, further work is needed in the development of curricula for the homemaking aspect of home economics in order to achieve a program more responsive to social conditions and needs.

FINE ARTS AND HUMANITIES

A small grant award in fiscal '73 was for the purpose of inquiring into the relationship between the fine arts and career education. Specifically, a three-day conference was held to examine the theoretical and practical issues surrounding the arts as an occupational cluster. Twenty participants prepared papers identifying the basic educational literature on the arts; problem areas; and general guidelines for the fine arts and humanities curricula at the elementary, middle and secondary levels. Participants also analyzed a new concept, "The cultural service field," which would afford career preparation in occupations which support the fine arts, such as: art dealership, public relations; gallery management; set design; costuming; lighting.

Over 2,000 copies of "The Arts, Cultural Services, and Career Education" have been published in a special issue of The Journal of Aesthetic Education.

In fiscal year '74, a contract was awarded for the development of curricula for the occupational cluster of Fine Arts and Humanities. Curriculum guides are to be developed for occupational exploration, orientation, and preparation for the junior and senior high levels.

CONSTRUCTION

The purpose of the Construction cluster project which began in 1971 was to develop instructional materials to be used at the secondary level for career development for construction occupations. The instructor's guides for grades 9 and 10 and for grades 10, 11 and 12 include: behavioral objectives, suggested activities for students and instructors, sources of information, related academic theory, and examples of lesson plan development. An in-depth exploratory approach introduces the student to construction occupations in seven broad areas—wood, metal, masonry, electrical, finishing, heavy equipment operations, and engineering and support services. One guide focuses on a choice for skill development within one of the seven areas. The student's resource manual for the exploratory phase enables the student to establish a broad base of information about occupations within the construction industry from which reasonable career decisions can be made. The student's resource manual for the skill development phase provides the basic technical information to coincide with and supplement the development of skills relevant to the specific job family within the related occupational field.

A grant extension, funded in 1973, provided for the validation of the materials in a number of representative school systems. In addition, the project is to develop materials for grades 7 and 8; develop an inservice training guide; conduct inservice training for instructors in the pilot schools; and collect information, which will be used in the development of a postsecondary articulation guide covering each of the five original cluster areas.

ENVIRONMENT

Workshops and one-half day conferences with a focus on environmental occupations as a career field were held around the country. Conferees included superintendents of local school districts or their representatives. The objectives of these conferences were:

1. To develop a basic understanding of career education concepts.

2. To stimulate environmental awareness among educational personnel and subsequently students.

3. To promote quality curricular programs in the environmental portion of career education.

4. To provide a sound basis for student career choices through improved vocational guidance and career counseling information.

Each delegate attending received a completed handbook which contained a comprehensive overview of the key concepts for which the conferences were organized and a complete library of information on environmental occupations; two environmental education courses designed for high schools; and an annotated bibliography of literature, audiovisual material, and programs of ecological-environmental content.

A publication, Career Education and the Environment was printed by the Government Printing Office. Over 35,000 copies have been sold.

MARKETING AND DISTRIBUTION

A grant was awarded for the purpose of developing an annotated bibliography of distributive education materials, to serve as one basis for curriculum decisions in the development of distributive education curricula. Personnel from seven States were involved in the review and evaluation of annotated materials, and as a result - a 695 page, two volume annotated bibliography was developed. Copies were disseminated to the 50 State departments of education, to local education agencies as requested, to every distributive education teacher and every State supervisor for distributive education.

A project begun in 1973, is designed to prepare two resource guides, for the inclusion of the marketing and distribution occupational cluster within the framework of career education. One guide provides a general conceptual framework for curriculum development in marketing and distribution. The other includes all aspects of a curriculum presentation for exploratory experiences in the middle school years. Fundamental to the development of materials for this project is the review of literature, programs, projects, and the U.S.O.E. occupational taxonomies relating to career and distributive education.

Guides in draft form were presented to a national conference of 100 educators for further inputs from the field. Before printing and dissemination, field tests will be conducted in three different settings and will involve integration with other occupational exploration materials or in-depth exploration.

MANUFACTURING

The purpose of the Manufacturing cluster project is to develop a nationally applicable, high school level curriculum for use at grades 9 and 10, 11 and 12 in the manufacturing occupations. The project uses an integrative model which delineates manufacturing functions, processes and products and provides a useful design for teaching manufacturing at the four successive phases of career education. It represents a synthesis of vocational, industrial arts and general education and also involves working relationships between education and industry.

Teaching guides include learning activities, learning objectives, materials/media, and means of evaluation as well as guidance information. Student resource manuals are designed for the exploratory and preparation levels and provide preparation for job entry, postsecondary training, or higher education. The manuals also include means for student self-assessment.

The materials have been field tested at five sites and final teaching guides and student resource materials should become available in 1975.

PUBLIC SERVICES

The Public Service cluster project includes a national search for exemplary public service programs and instructional materials; development of teacher's guides for the four phases of career education; pilot testing of these guides; preparation of an articulation component between senior high and post secondary institutions; and the development of a "coordinator's implementation guide" for use by local school district staff.

The public service occupations cluster was divided into eight sub-clusters and a "common core" was established for content material found to be common across the full cluster. There is a set of guidelines for an exploratory program at the junior high school level as well as materials applicable to more specialized study in each of the sub-clusters. These materials have been field tested at eight locations, including California and New York and have involved nearly 5,000 students. In addition, the project has established liaison channels with over 80 organizations and groups and has involved over 500 individuals from 21 States in its development and implementation.

In fiscal '74, a contract was awarded for the development of a series of films and related print-based instructional materials on the common core materials in the Public Services curriculum development project. The films are designed for delivery by cable TV to provide occupational instruction in the home.

PERSONAL SERVICES

A proposal was funded in FY '74 for curriculum development in the Personal Services area. The purposes of this project are to determine: the state-of-the-art, specific bases for curriculum decisions in the area; curriculum in junior and senior high school levels for occupational exploration and preparation; and to develop such modules as may be needed for developing awareness and training for the personal services occupations. All materials will be field tested at a minimum of three sites.

TRANSPORTATION

A project funded in fiscal '73 as an extension of an existing grant, was designed to produce and validate curriculum materials, student resource manuals, a teacher's guide to career orientation in transportation, and a guide directed to the transition from K-12 to postsecondary transportation occupations education. Curriculum development of Phase I and postsecondary articulation materials was planned for January, 1973 to June, 1974. Pilot testing of Phase III and IV materials was planned for the 1973-74 and 1974-75 school years, and pilot testing of the Phase II and postsecondary materials was projected for the 1974-75 school year. The period from June, 1975 to December, 1975 will be used for revision, updating, and preparing materials for final publication through a commercial publisher.

The project has generated a great deal of interest in this new occupational cluster. Material from the teacher's guides has been adapted and used in an information booklet, "The Sky's Not the Limit for a Career in Transportation." Articles have appeared in several professional journals. A secondary and postsecondary consortium for transportation education in the San Francisco area has been formed as a direct result of this project.

MARINE SCIENCES

In FY '74, a project was funded for the purpose of determining the state-of-the-art of marine science education and the resultant implications for future educational programs and curriculum decisions related thereto in the context of the career education theme. The general objective of this project is to develop a publication tentatively titled Career Education in Marine Science Occupations--Guidelines for Curriculum Development in Grades K-14.

ARTICULATION OF SECONDARY AND POSTSECONDARY PROGRAMS IN FIVE OCCUPATIONAL CLUSTER AREAS

As secondary school programs in career education become more sophisticated, articulation problems with respect to postsecondary education may become more complex. The basic purposes of this project were to identify and study the existing and potential problems of articulation between high school and post secondary career education programs and to develop suggested guidelines to solve these problems, if they occur.

Project staff members obtained information and materials concerning articulation problems and their solutions from five on-going occupational education curriculum projects and various postsecondary occupational programs in the cluster areas of construction, manufacturing, public service, transportation, and communications and media. The resultant publication focusses on admissions policies for postsecondary occupational education programs; open door admissions requirements; student testing for entry level or advanced credit or placement; counseling at both secondary and postsecondary levels; student attrition rates; adult education programs; and student recruitment and job placement activities.

MONITORING OF PART I PROJECTS

Monitoring of curriculum projects funded under Part I is shared by specialists in technical areas throughout BOAE and members of the Curriculum Development Branch. This is a particular strength of the Curriculum Development Program. It means that technical specialists in the content fields are contributing the benefits of their expertise to the projects and are, in turn, increasing their expertise through contact with specialists in the field.

IMPACT OF CLUSTER CURRICULUM PROJECTS

Since it takes at least two years to develop and test a major curriculum package, and an additional four months or so for printing and dissemination, the impact of much of the early Part I effort is only now being felt. A number of projects more recently funded are in the development and testing phases. Nevertheless, there are many evidences that the Part I Curriculum Program is contributing significantly to broadening the concept of vocational education and improving the quality of its programs--and that is the broad purpose of this program.

Beyond the occupational clusters and building on the cluster curriculum efforts there is need for specific occupational preparation curricula for both secondary and postsecondary levels. Continuous curriculum development is essential for updating and for the achievement of curricula for emerging occupations.

THE CLUSTER CONCEPT: DEVELOPMENT OF CURRICULAR MATERIALS FOR THE PUBLIC SERVICE OCCUPATIONS CLUSTER

Patrick J. Weagraff

Associate Commissioner for Occupational Education
Massachusetts State Department of Education*

INTRODUCTION

It is indeed paradoxical that in a country which has traditionally placed high value on the world of work and the work ethnic, we face the reality that for many the curriculum in our schools largely prepares them only for the next higher level on the educational ladder.

If you believe as some of us do that this paradox represents a clue to one of the real problems of our contemporary society, then you should be interested in what the cluster framework in career education is and how it is bringing about drastic changes in curriculum patterns and instructional products.

The intent of this paper is not to reiterate the philosophical rationale or even the imperative need for a comprehensive career education system. This is being well documented by prominent scholars throughout our nation. It is the intent, however, to provide:

- An overview of the cluster concept
- How it was used for the area of public service
- Implications of cluster
- Limitations of cluster approach

THE CLUSTER CONCEPT

The cluster concept is not new. Under different titles and within varying kinds of programs, it has reemerged repeatedly during the past fifteen years. However, the cluster concept approach that provides for exploration and preparation for a number of careers or occupations has taken on a renewed significance to vocational education. Grant Venn writes:

> ...Most young people today will have to change occupations four or five times during their lives. Therefore, a long-range policy of teaching simple, specific job skills no longer makes sense; yet specific entry skills are required for that first job. Workers must be trained for clusters

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* (At the time of presentation, Dr. Weagraff was the Project Director, Public Service Occupations Curriculum Project, California State Department of Education).

> of jobs so they may switch from one job to another as technology advances. This dilemma is a major challenge facing educators, labor, industry, and business.[1]

This concern for cluster approaches seems to have gained momentum from a very reasonable desire on the part of vocational educators to better meet the needs of students. Since young people have a broad range of interests and capabilities, appropriate initial choices are facilitated by a knowledge of families of occupations. Baer and Roeber have commented on the advisability of preparation for several occupations:

> It is becoming more generally recognized that early training... should be broad enough to give the student the background for a group of related occupations. Thus, he is not driven into specific occupational choices before his interests have matured sufficiently for him to choose a specific field of work. When he is ready to enter the job market, his chances of successful placement are increased if he is prepared to begin at any one of several jobs in a given field of work.[2]

Simply stated, the cluster concept is an organizational approach which is directed toward the preparation of individuals with skills, knowledges, and attitudes required for job entry into a family or cluster of occupations. Its basic premise is the development of individuals with job entry capabilities for a number of related occupations rather than indepth preparation for a specific single occupation.

The cluster concept approach to organization of content and instruction differs from conventional organizational approaches in terms of scope and depth. The typical vocational education program, for example, is found at the secondary level and is designed to prepare an individual extensively for a specific occupation such as carpentry, masonry, or plumbing. The cluster concept as it has emerged in career education provides an individual with early awareness and exploratory learning opportunities culminating in the development of job entry competencies for several occupations found within an occupational cluster such as construction. This approach does not purport to produce a highly skilled craftsman but job entry competencies for a number of related occupations within the cluster.

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[1]Venn, Grant. "Vocational Education in a Dynamic Labor Market." Manpower, Vol. 1, No. 9 (October, 1969), 25-27

[2]Baer, Max, and Roeber, Edward C. Occupational Information: The Dynamics of Its Nature and Use. Chicago: Science Research Associates, 1964.

AN OVERVIEW OF PAST CLUSTER SYSTEMS

The term cluster, while still in a state of evolution, has taken on a variety of meanings. It may refer to a simple grouping of seemingly like jobs, to broad institutional groups such as transportation, manufacturing or public service, to groups based on similar job products, to groupings based on analysis of work tasks, and so on.

Much work has been completed during the past twelve years to find methods to develop clusters. In general, such work may be grouped into three broad approaches which are: descriptive, task analysis and sociological/ psychological.

It is notable that all three approaches are valid, usable, and, in almost every instance, meet the needs of the organization concerned with their development.

Descriptive Approach. This approach has tended to describe jobs and group them on broad generalities. Obviously, this approach to clustering is readily adaptable to current programs and facilities in vocational-technical education.

Several agencies of the federal government have used this approach to cluster development quite extensively. The Occupational Outlook Handbook,[3] prepared by the U.S. Department of Labor, and the text, Vocational Education and Occupations[4] prepared jointly by the U.S. Office of Education and the Department of Labor, both utilize a job descriptive base for cluster development.

Teh best example of this approach is the draft of the 15 occupational clusters,[5] developed by the Division of Vocational-Technical Education, U.S. Office of Education. While these clusters are still in their developmental stage, they hold great promise as an organizational tool if during their refinement the problem of "job overlap" can be eliminated.

Task-Analytic Approach. As the name implies, this approach tends to utilize typical job analysis techniques relying on similarities observed among various jobs. Numerous individuals including Frantz[6] have utilized task analysis as a basis for forming clusters.

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[3]U.S. Department of Labor. Occupational Outlook Handbook, U.S. Government Printing Office, Washington, D.C.. 1970-71.

[4]U.S. Department of Health, Education and Welfare and U.S. Department of Labor. Vocational Education and Occupations, OE-80061, U.S. Government Printing Office, Washington, D.C., July 1969.

[5]_____, Division of Vocational and Technical Education. "Draft: Fifteen Occupational Clusters," Washington, D.C.

[6]Frantz, Nevin R. "The Development of a Curriculum," Journal of Industrial Education, 1968, pp. 17-24.

Functional skills and knowledge are identified through job analysis. Those things that are common to serve jobs or job groupings are then clustered together.

It is clear that a task analysis base for job clustering is a sensible and rationale base for curriculum building in vocational education. Despite the apparent rationality for this approach, there are some limitations in its application to career education, particularly with that phase concerned with occupational awareness.

Sociological/Psychological Approach. In recent years, several clustering approaches have been suggested which utilize the sociological or psychological aspects of occupational choice and worker function as its foundation.

Proponents of this approach including Super[7] and Roe[8] have utilized two and sometimes three-dimensional matrices of occupational families arranged in order of vertical (status) and horizontal (occupational areas) position. The Dictionary of Occupational Titles, Vol. III,[9] prepared by the U.S. Department of Labor, also uses this method to describe worker traits.

While the sociological/psychological approach to clustering is sound and systemic, it is generally difficult to understand or use. However, Robinson, Athanasiou and Head[10] have used this approach successfully. They simplified the matrix by utilizing a method of coding occupations that combine worker characteristics and occupational characteristics.

CLUSTER FRAMEWORK

The problems of delivering a comprehensive career education program are compounded by the complexity of the American economy and the diversity of the American labor force. The Dictionary of Occupational Titles, and the Department of Labor catalog, for example, lists more than 45,000 jobs which exist today. 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

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[7]Super, Donald. The Psychology of Careers, Harper and Row, New York. 1957.

[8]Roe, Anne. The Psychology of Occupations, John Wiley and Sons, New York, 1956.

[9]_____. Dictionary of Occupational Titles, Third Edition, Vol. I, II, 1965. Supplement: Selected Characteristics of Occupations (Physical Demands, Working Conditions, Training Time), 1966. Supplement: Selected Characteristics of Occupations by Worker Traits and Physical Strengths, 1968. U.S. Government Printing Office, Washington, D.C.

[10]Robinson, J., Athanasiou, R., and Head. K. Measures of Occupational Attitudes and Occupational Characteristics, Survey Research Center, Institute for Social Research, The University of Michigan, Ann Arbor, Michigan, 1969.

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 twenty thousand separate jobs, it would be feasible to deal with 15 or 20 broad career clusters.

As previously mentioned, the term cluster has taken on a variety of meanings. It may refer to a single grouping of seemingly like jobs, to institutional groups such as transportation, manufacturing, or public service. Within the context of career education, it has come to be associated with a broad framework around which instruction at differing age levels can be structured.

The cluster framework, as it has emerged in career education, provides an individual with an early awareness of careers. Children in the early grades deal with the major concepts of the cluster. For example, "a few people protect the many," is the major concept students should be aware of when studying the public service cluster. As students progress, they have exploratory learning opportunities culminating in the development of job entry competencies.

Many teachers and schools use the cluster framework as a means to orient students to careers. At the elementary level, all clusters are studied. In grades 7 and 8, a student may choose to study five or six clusters. By grades 9 or 10, this exploration process may narrow down to one or more areas. In grades 11 and 12, students may concentrate their career preparation in one cluster.

PUBLIC SERVICE CLUSTER ANALYSIS

One of the most obvious difficulties confronting many local teachers and administrators is deciding how to proceed with the analysis of a cluster or clusters. In the end, there is always a judgmental factor, selecting one of the three approaches which best meets local needs. I do not want to suggest there is or should be a single approach. Rather, the problem is deciding what the cluster must account for and how it will be used.

A fundamental step taken by the California State Department of Education in developing appropriate secondary level curriculum for the public service occupations cluster was the definition of what is meant by "public services." The Public Service Project staff, along with a group of nationally prominent persons with expertise in local, state and federal government, as well as secondary and post-secondary education, adopted a definition for public service as follows:

> Public service occupations are those occupations pursued by persons performing the functions necessary to accomplish the mission of local, county, state and federal government, excluding the military service and trades requiring an apprenticeship. These missions reflect the services desired

> or needed by individuals and groups ... and are performed through arrangements or organizations established by society, normally on a nonprofit basis and usually supported by tax revenues.

Based on this defintion, eight "major occupational groups" and thirty-nine "major job families" were also identified. Figure 1[11] identifies the major occupational groups and job families. These major occupational groups reflect discrete governmental functions performed at local, state and federal levels.

Once the major occupational groups in a cluster were selected, it was relatively easy to identify the major job families found in each. The following criteria were found of use in selecting the job families.

1. The job family had a favorable employment outlook.
2. The job family contained jobs at para-professional, professional, skilled and semi-skilled levels.
3. Jobs in the family had some opportunity for employment in various sections of the country.
4. Jobs in the family were a part of a reasonably well-defined career lattice.

Validation of the analysis was critical. Over 400 people from twenty-one different states were involved in the validation of the public service analysis. Most of these people were employed in government service or had a direct affiliation with it.

INSTRUCTIONAL PRODUCTS FROM ANALYSIS

The California State Department of Education has spent almost two years preparing nationally applicable curriculum guidelines for the public service cluster.

The curriculum guidelines are organized around the eight major occupational groups and thirty-nine job families. Figure 2 shows these guides are sequenced into three phases - exploration, orientation, and preparation.

The exploration materials are designed for use at the junior high school level. They provide the student with a breadth of "hands on" experiences to help them make a preliminary career choice. These materials are designed to accompany instruction in other clusters at the junior high level since students will be exploring several clusters simultaneously.

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[11] Weagraff, Patrick J. "Identification of Major Occupational Groups and Entry Level Jobs in Civilian Public Service," California State Department of Education, Sacramento, California, 1972.

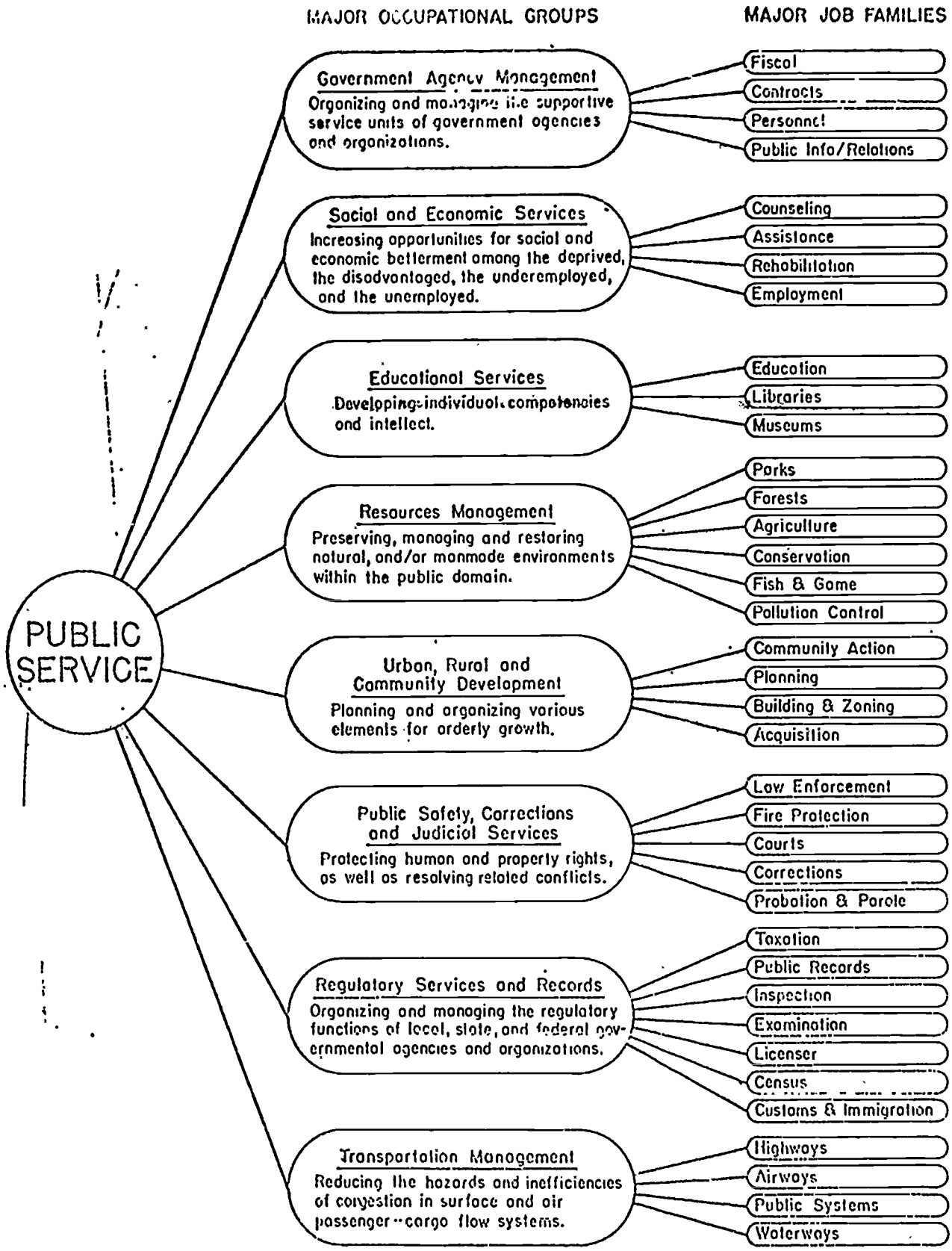
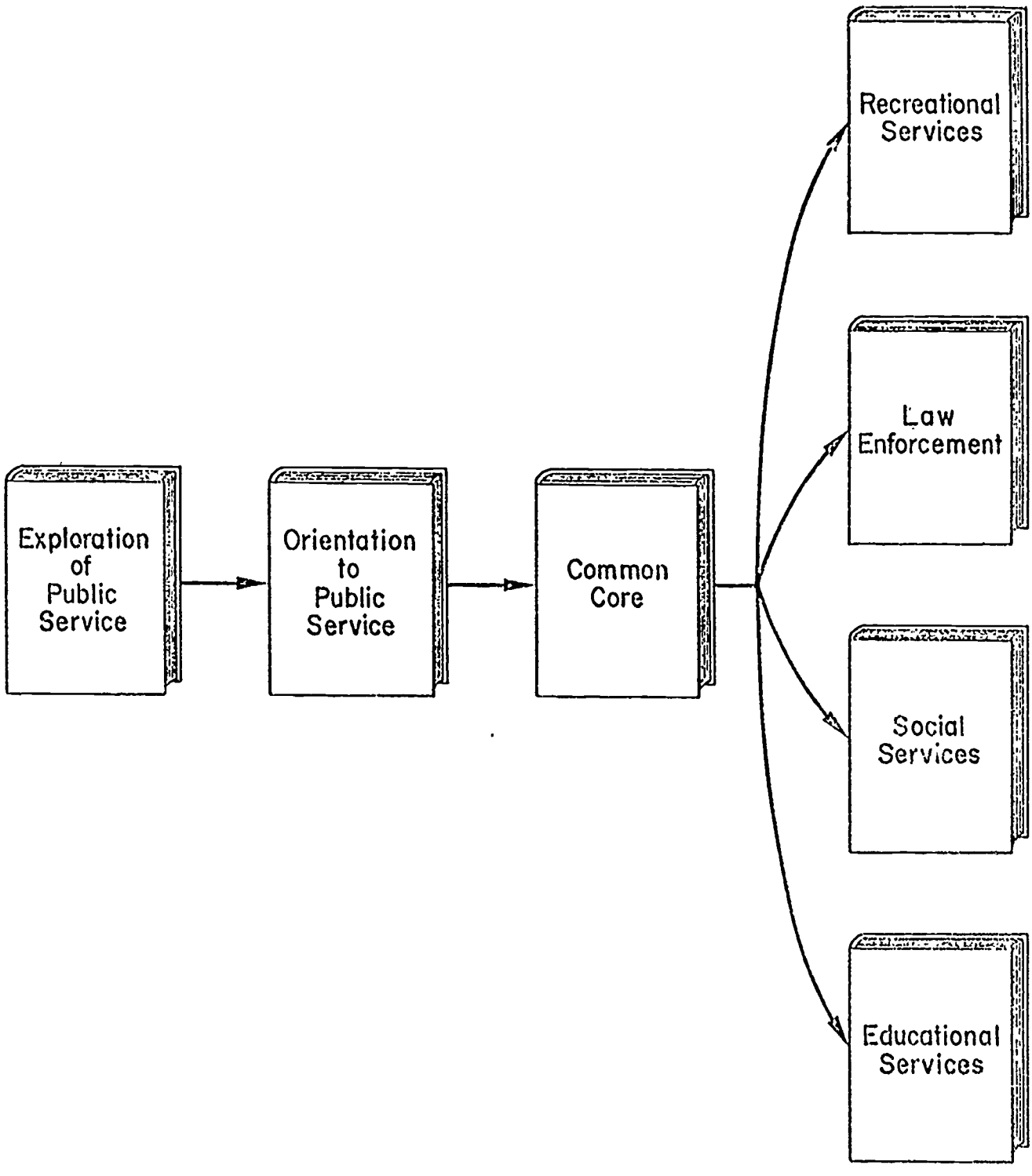


Figure 1 - Occupational Groups and Job Families in Public Service



Public Service Curriculum Guides

Figure 2

A second curriculum guide designed to orient students to public service contains a separate section devoted to each major occupational group. This guide is far more specific about careers in public service, duties of workers, job requirements, training needs, and the type of career ladder typically found for each job family.

The third set of guidelines is designed to provide students with elementary job skills in four specialty areas. They are: law enforcement; educational services; social services; and recreational services. This preparation phase also utilizes a "common core" approach to these four specialty areas. Content within this common core includes: interpersonal relationships; written communications; computational skills; decision-making; and good grooming.

All guides contain subject matter content in narrative form; teacher management activities; student learning activities; and appropriate instructional resources available from commercial sources.

All of the guidelines utilize a unit approach and are highly adaptable to various types of learning situations. Since each unit is self-contained, a teacher can readily select the objectives, content, and instructional materials required to meet local needs.

All of the materials were field tested at eight locations across the country. A total of approximately five thousand students were involved. This evaluation includes assessment of: content validity; administrative feasibility; product usability; and student learning gain. Preliminary feedback from the demonstration sites indicates that the materials are useful, appropriate, and result in significant student learning gain.

IMPLICATIONS OF THE CLUSTER FRAMEWORK

With the increased use of cluster frameworks, many implications seem to be evident. Among these are the following:

1. Career education in general, and more specifically the cluster approach, will bring about massive changes in instructional products. Few instructional materials are available for career education, particularly at the elementary level. New career orientated products and "learning systems" are being developed by several large publishers and media organizations. While these products are starting to appear on the market, it won't be until late 1975 that they are generally available.

2. Cooperative or work experience education is becoming a more common pattern of curriculum organization. Most work experience programs in the past have been vocational in nature.

The use of a cluster framework is resulting in work experience programs which are largely exploratory or prevocational in their intent.

3. If the cluster framework is widely adopted, a greatly expanded vocational education program at the secondary level will result. Traditionally, vocational education has dealt with only a few occupational areas such as agriculture or trade and industrial occupations. Programs in new career clusters such as public service, marine science, and communications should emerge in secondary schools.

4. The experience of school districts that have implemented the cluster approach indicates it is much easier to infuse the clusters ito the curriculum of the self-contained classroom taught by a generalist than into a subject-centered program taught by a specialist. Since most elementary schools are self-contained, it follows that the greatest immediate impact of the cluster approach will be at the elementary level.

5. The cluster framework will call for more integration of the disciplinary subject matter in the high school. With the explosion of subjects competing for a place in the curriculum, it seems reasonable that English, science, mathematics, and social studies have some degree of relevancy to one or more clusters.

6. Since use of a cluster approach requires optimum utilization of outside resources, we could easily shift to a community school curriculum pattern.

7. There is some evidence to indicate that the cluster framework blends exceptionally well with team teaching and use of instructional units at the classroom level. Accordingly, both team teaching and unit organization are taking on increased emphasis in schools where career education is being implemented.

LIMITATIONS OF CLUSTER APPROACH

While the cluster framework has a promising future, there are many limitations that must be recognized and dealt with:

1. The cost of implementing a comprehensive cluster system really is not known at this time. Full implementation of a cluster system in K-12 situations could cost from 5 to 8 times the amount of current state and federal appropriations.

2. The clusters have a large amount of "overlap." For example, are jobs in the parks field a part of public service, natural resources, or recreation, hospitality and tourism? Failure to adequately define the clusters could result in costly duplication of instruction.

3. No single set of clusters exists. There are groups of clusters which tend to describe what a worker does. Still other cluster systems are rooted in the sociological or psychological complexities of occupational choice and worker function.

4. A cluster framework must have a balanced program to be successful. Programs dealing with career orientation need to be followed by skill programs for those careers. This usually means that a school district has to enlarge its vocational and adult education components. In this period of educational belt tightening, this may be more a dream than reality.

5. Our educational system is not in a position to absorb a large number of students in any comprehensive cluster system. Many schools are too small, others have specialized or separate vocational facilities. Thus, the capacity of our educational system to respond to a cluster framework is limited.

SUMMARY

The advantages and the disadvantages of a cluster system are realistic. We know the installation and operation of a cluster approach to career education is meaningful, feasible, costly, and viable. We also know it can only be implemented after considerable diligence and hard work on the part of administrators and teachers working as a team with their students, parents, and community.

It has been said that neophobia--the fear of anything new--will plague development of career education and the cluster approach. While this is undoubtedly true, we must accept the fact change is required if we are to effectively implement career education. Hopefully, neophobia will not stop you from exploring the use of the cluster approach or implementing the public service cluster in your career education program.

OCCUPATIONAL CAREER CLUSTERS
THE OREGON WAY

Leonard Kunzman

Director, Career Education
Oregon State Department of Education

Career Education in Oregon

Career education, as an integral part of the total educational program, embraces the concept that each individual must learn to function effectively in six life roles: learner, individual, producer, citizen, consumer and family member. Focusing on the producer role, career education provides learning experiences to develop the attitudes, knowledge and skills that enable the student to perform successfully in an occupational role and assists the student in related life roles.

Career Education and the Role Clusters Play

Occupational career clusters play an important role in the overall concept of career education in Oregon. The following points define that role at each level of career education and briefly outline the sequence of events in occupational cluster development in Oregon.

The career development process of awareness, exploration, preparation, and specialization is being implemented at all educational levels in Oregon's public schools.

Career awareness includes learning activities in grades K through six where students develop awareness of the many occupations ultimately available to them, awareness of themselves in relation to the role of a producer, and establish foundation for wholesome attitudes toward work and society, and respect and appreciation for workers in all fields. Activities are conducted in relationship to the clusters and the students make tentative choices of career clusters to explore during middle years.

Career exploration includes programs in the mid-school years, grades seven through ten. At this level, students explore key occupational areas and assess their own interests and abilities. They become familiar with occupational classifications and clusters, grow in awareness of relevant factors to be considered in decision-making and develop tentative occupational cluster preparation plans and arrive at a tentative career choice.

Occupational career clusters offer students preparation at the grades eleven and twelve level. Here students acquire occupational skill and knowledge for entry-level employment and/or advanced occupational training in a post-secondary setting. Clusters are designed around school experiences relevant to the student selected career goals, development of acceptable job attitudes and skills, and encouraging and facilitating student involvement in cooperative work experience and vocational youth organizations. In 1978, under new high school graduation requirement legislation, all students will be required to have survival level competencies in a career area of their choice. Although the 4 credit vocationally approved cluster program goes beyond this requirement, the legislation does in fact insure that all students will have direct involvement in career development activities at the high school level.

Occupational specialization occurs at the post-high school level and includes programs in community colleges, apprenticeship, private vocational-technical schools, four-year colleges and universities. At this level, students obtain specialized training in areas related to a particular part of the clusters they were involved in at the high school level.

Cluster Development

The problem of delivering a comprehensive career education program is complicated by large numbers of individual job types in the world of work (the DOT lists some 20,000). In order to deal with this problem in terms of program planning and implementation at all levels of career education, it is necessary to group jobs into some 15 or 20 career clusters which have the capability of encompassing the majority of job titles. In addition, each job cluster should be designed to encompass a career ladder. For example, the health cluster should include jobs from nursing aide to medical practitioner. In order to complete this task, some organizing principles must be determined before cluster development is begun.

The Organizing Principle of Oregon Clusters

Oregon clusters are organized on the principle of grouping occupations having similar competency requirements. To possess a competency means the worker has the ability to perform effectively the tasks required of the occupation or preparatory to taking the student's next educational step in a post-secondary setting. Implicit in this point of view, is a consideration of all the recognized aspects (cognitive, psychomotor, and affective) of the tasks performed.

General Model of Cluster Development (See Appendix A)

The model of cluster development begins with the overall world of work and proceeds through the steps of: cluster identification, occupational analysis, task-competency analysis, instructional analysis, and implementation.

1. Identification of clusters (See Appendix B)

The basic criteria for the identification and establishment of a cluster area in Oregon includes a grouping of occupations having similar competency requirements with 10,000 or more people employed in the occupational cluster group. In addition, it requires a projected expansion and/or replacement need of at least 2,000 in the next five years.

The 14 core vocational clusters presently identified include: agriculture, forest products, marketing, health, food service, construction, electricity/electronics, accounting, clerical, stenographic, industrial mechanics, metals, service, and graphics. These clusters encompass some 80 percent of employment in Oregon. A further occupational cluster now under investigation includes occupations in transportation and distribution.

In addition to these, several smaller career areas have been identified and are treated in ongoing programs outside the vocational area such as performing arts, language, and physical/biological science careers.

2. Occupational analyses (See Appendix C)

The purpose of the occupational analysis is to identify all occupations that fit within the cluster as defined by the cluster rationale. In addition, key occupations are selected for purposes of task competency analysis and curriculum development. The criteria for a key occupation specifies a minimum employment of 250, demand of 100 in five years and indication that the occupation is representative of a group of closely related occupations within the cluster.

3. Task-competency analysis (See Appendix D)

Task analyses are completed on key occupations. These task inventories are compared to identify competencies common to all the key occupations identified in the cluster and to the cluster in general. At this analysis stage, the original inclusion of an occupation within a cluster can be validated on a detailed competency basis.

4. Instructional analysis

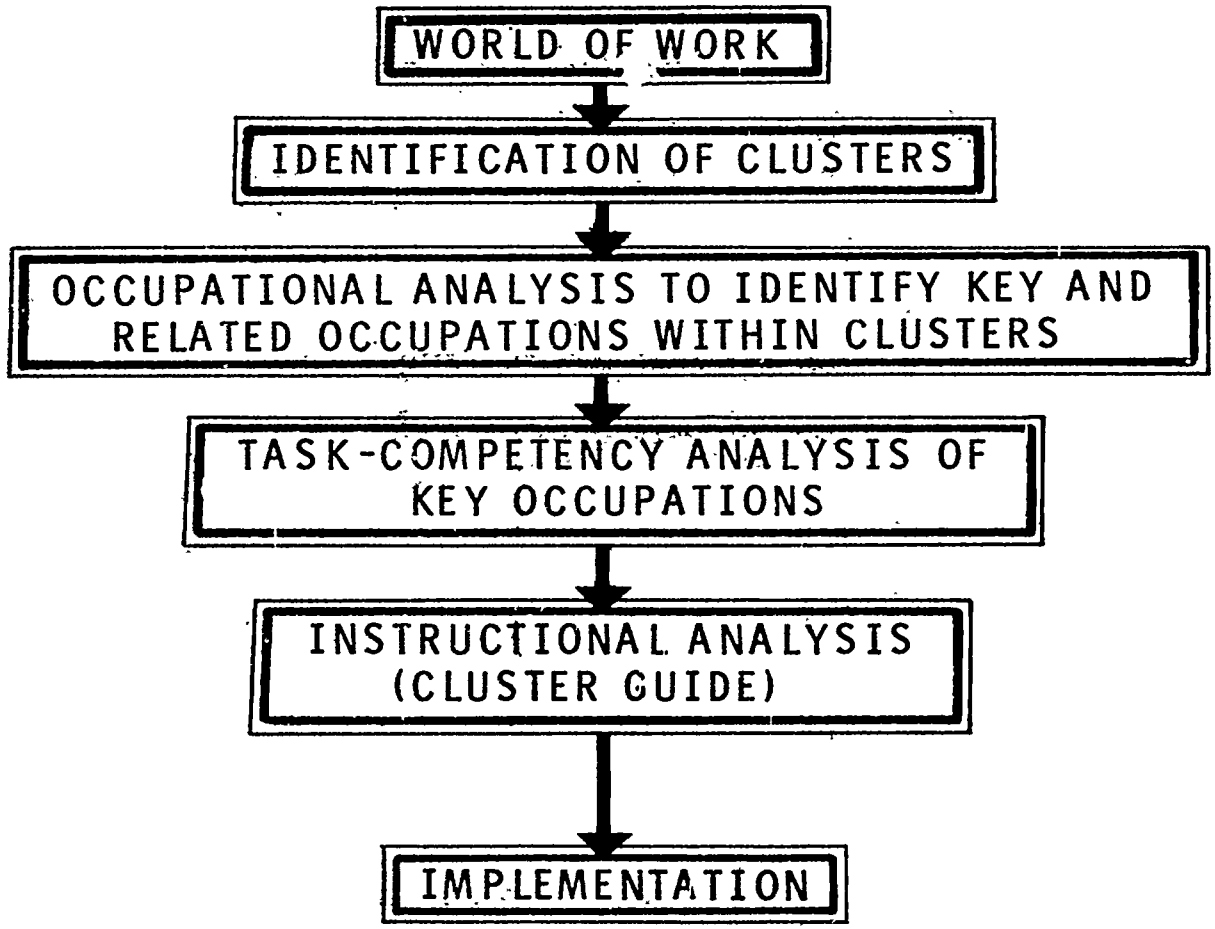
This step involves the identification of occupational tasks and competencies appropriate for instructional activity development for each level of career education. Expected behaviors are identified and learning objectives are written.

Classroom activities are organized and curriculum materials developed to accomplish instructional objectives.

Implementation of Career Education

At the awareness and exploratory level, the goal is to have activities available to 100 percent of the students by 1975. At the high school level, the goal, by 1979, is to provide 100 percent of high school graduates with minimum career competencies required for graduation and enroll 70 percent 11th and 12th grade students in approved vocational cluster programs. At present, approximately 45 percent of 11th and 12th grade students are enrolled in these vocational cluster programs.

GENERAL MODEL OF CLUSTER DEVELOPMENT



IDENTIFICATION OF CLUSTERS

CRITERIA

1. A Grouping of occupations having similar competencies
2. 10,000 or more employed in the state
3. 2,000 or more projected expansion and replacement needed in 5 years

CLUSTERS

CORE VOCATIONAL CLUSTERS

1. AGRICULTURE
2. FOREST PRODUCTS
3. MARKETING
4. HEALTH
5. FOOD SERVICE
6. CONSTRUCTION
7. ELECTRICITY-ELECTRONICS
8. ACCOUNTING AND BOOKKEEPING
9. CLERICAL
10. STENOGRAPHIC
11. INDUSTRIAL MECHANICS
12. METALS
13. SERVICE
14. GRAPHICS

ADDITIONAL CAREER AREAS

1. TRANSPORTATION
2. PERFORMING ARTS
3. LANGUAGES
4. SCIENCES

Occupational Analysis Within Cluster

Criteria

Comprehensive Listing of Occupations in Cluster... based on common competency concept and rationale for cluster in question.

Key Occupations... 250 employed-100 needed in five years, representative of a group of closely related occupations within the cluster.

Example

ELECTRICITY-ELECTRONICS

RATIONALE	KEY OCCUPATIONS
Occupations primarily concerned with the generation, distribution and control of electrical energy related to industrial, commercial and domestic applications.	Electrical Engineer Electronic Technician Electrician Elect. Appliance Serviceman Lineman Radio & T. V. Repairman Wireman/Installer Electrical Assembler

TASK-COMPETENCY ANALYSIS

1. Inventory tasks for key occupations
2. Analyze tasks for similarity between occupations and rank tasks
3. Determine competencies common to the occupations and the cluster
4. Validate inclusion of occupation in cluster on a common competency basis

OREGON BOARD OF EDUCATION
940 LANCASTER DRIVE, NE.
SALEM, OREGON 97310

JESS FASOLD
SUPERINTENDENT OF PUBLIC INSTRUCTION

TASK INVENTORY

Job Title

Analyst

Processes

INSTRUCTIONS:

List each manipulative and knowledge skill relating to the job noted above. To the right of each task is a series of columns asking specific questions about the entry level, level of difficulty, frequency, and type of skill involved as indicated on the sample sheet.

Block No.	Task No.	Task Description	Entry Level		Level of Difficulty			Frequency		
			Entry	On The Job	Easy	Moderate	Difficult	Small Amount	Average Amount	Great Amount

OCCUPATIONAL CLUSTERS AND SECONDARY TO POST-SECONDARY ARTICULATION

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INTRODUCTION

Numerous research projects, workshops and seminars have been conducted throughout the United States concerning the identification of problems that students encounter in making the transition from a secondary institution to post-secondary institution. However, few of these activities or projects have attempted to suggest alternative solutions to these problems.

The implementation of career education concepts and curricula into the existing school structure will affect articulation problems of students moving between institutions. Different implementation patterns and differences in the variety and quality of programs may intensify or create some problems and eliminate others.

The characteristics of the students entering post-secondary institutions will vary from year to year. Students with broad backgrounds in career education and those with very little will be seeking admittance to similar post-secondary programs. As career education is implemented into the educational programs, students will become aware of their educational needs and will be seeking programs to meet these needs. Some articulation problems will be alleviated by the students' improved abilities in career decision-making.

Through the implementation of career education in elementary and secondary schools, students will have increased knowledge concerning occupations and, in many cases, job-entry abilities and skills. Students may have completed career awareness, orientation and exploration programs designed to provide knowledge of a variety of occupations, increased career decision-making abilities, and some hands-on experience. Students who have completed the preparation phase may have developed occupational competencies designed to provide the opportunity for employment or advanced education in a post-secondary program.

OCCUPATIONAL CLUSTERS

The United States Office of Education has attempted to classify the world of work into 15 occupational clusters. Initially, five projects were funded by the Bureau of Occupational and Adult Education to develop curriculum materials for the occupational clusters of: construction, communications media,

*At the time of presentation, Dr. McKinnerney was Principal Investigator and Associate Project Director, College of Education, Texas A&M University.

manufacturing, public service and transportation. In 1973, the Career Education Articulation Project was funded by the USOE to study articulation between secondary and post-secondary education. One of the major aspects of the Career Education Articulation Project was to study the effect that implementation of the occupational cluster curricula developed by the cluster projects would have on articulation of secondary and post-secondary education.

A major draw-back to this aspect of the articulation project was the fact that each of the cluster projects were involved in either developing, pilot testing, or field-testing their cluster curriculum materials. Hence, no graduates of any of the secondary programs utilizing the cluster materials were available. As a result, the effect that implementation of the cluster curriculum materials would have on articulation of secondary and post-secondary education was only conjectural on the part of the project staff, teachers, and students participating in the pilot or field-testing phases.

An important fact evolved out of the cluster projects. The utilization of clusters of occupatins seem to be a convenient system for organizing the world of work to serve an unobtrusive function in the student's preparation for making career decisions. As far as an individual student is concerned, the cluster organization of the world of work has probably served its intended function when the student has made occupational choices and made a commitment to implementing those choices. In the preparation phase, the grouping of occupations by related knowledge and skill requirements may be more important.

Evolving from the cluster approach is the fact that problems the students encounter in making the transition from a secondary program to a post-secondary program are generalizable. Similar problems occur in each cluster. The nature of the problem may be different for each cluster but the basic foundations are identical. For example, students in the public service cluster curriculum may seek advanced placement in an apprenticeship program. In either case, the problems of advanced placement may be similar.

CAREER EDUCATION ARTICULATION PROJECT

The Career Education Articulation Project was assigned the specific task of: (a) identifying the problems students encounter in making the transition from secondary institutions to post-secondary institutions; and (b) suggesting alternative solutions to these problems. A suggested guide for improving articulation between secondary and post-secondary institutions was developed by the project staff and was titled Student Articulation Between Secondary and Post-Secondary Education. The suggested guide is available through the Superintendent of Documents, GPO. The focus of the suggested guide is on individual articulation from any secondary program or intervening employment to private, public, or employer-based programs and institutions such as community colleges, trade schools, technical institutes, baccalaureate institutions, manpower programs and apprenticeship, or other employer-conducted training programs.

The methodology for developing the suggested guide included: a review of the literature; contact and consultation with the five cluster projects and other projects; a National Advisory Committee Meeting; a National Review Committee Meeting; and contact with other educators involved in career education and/or articulation in general.

ARTICULATION PROBLEMS

What are some of the problems which students encounter in making the transition from a secondary institution to a post-secondary institution? A total of 33 general problems were listed in the publication Student Articulation Between Secondary and Post-Secondary Education. These problems were included in the following areas:

I. Admission Policies and Requirements

   A. Entrance into an Institution
   B. Identification of Student Program Objectives
   C. Student Appraisal
   D. Developmental Programs and Special Programs for Students
   E. Continuing Education Programs

II. Student Services and Assistance Programs

   A. Guidance and Counseling of Students
   B. Programs to Meet Special Needs

III. Transition Management

   A. Communications
   B. Coordination of Programs
   C. Recruitment by Institutions

The problems which students encounter in moving between and among institutions are multi-faceted in that they may be student generated, administrative, institutional, financial, geographical or sociological in nature. The student who has completed an occupational cluster program hopefully will not encounter as many problems in making the transition as a student without this type of program. However, articulation problems will still exist for all students.

Upon seeking admission to a post-secondary institution, students encounter problems in varying degrees in any or all of the problem areas specified above. The student may be denied admission because of admission policies and requirements. Or, the student may be discouraged from enrolling in a particular program or institution because of a lack of adequate student services or assistance programs. A lack of finances may prohibit the enrollment of the student.

The problems involved in transition management extend into the secondary program to the point in time at which the student begins to make career decisions and to select a method of fulfilling a career choice. It is at this point the receiving institution (post-secondary) begins to have an effect on the student and the prospective enrollment of the student into the institution. (This paper will deal only with problems and alternative solutions involved in managing the transition of the student between institutions.)

Many students do not receive maximum benefit from their post-secondary program because of minimal articulation efforts between the secondary and post-secondary institutions. In some cases the student has not received prior knowledge of the advantages and limitations of the post-secondary program. In other cases, this may be a result of limited communication between institutions.

The implementation of the occupational cluster programs into the secondary schools will have a direct effect upon the post-secondary institutions. If the post-secondary institutions are not cognizant of the secondary programs, articulation problems will invariably increase for the student with an occupational cluster preparation. The student who has completed the preparation phase may encounter problems in gaining advanced placement in a post-secondary program. The student may be required to duplicate course work because the post-secondary institution is not aware of the competencies the student attained in the secondary program.

Problems which affect the management of the transition between institutions include:

The faculties and representatives of many secondary and post-secondary schools are not knowledgeable of what the other schools are striving to accomplish. This lack of communication causes duplication of effort, as well as conflicts within and between institutions.

Few attempts have been made to develop articulation agreements between secondary and post-secondary occupational programs at the local, regional, or state level.

The cost of adding new equipment and building new facilities is prohibitive for occupational programs that need updating or expanding. Many secondary and post-secondary institutions have not attempted to share facilities and equipment for the purpose of decreasing the cost of updating and expanding new and/or existing programs.

Many secondary and post-secondary institutions have made few efforts to develop cooperative plans for implementing or developing programs, course content, admission policies and

procedures, transfer guidelines and placement guidelines. This causes a wide variety of policies and procedures among institutions.

The above examples have been stated to indicate existing as well as potential problems which must be considered in providing a smooth transition for the student moving from a secondary program to a post-secondary program.

ALTERNATIVE SOLUTIONS

The types of problems as well as the complexity of the problems which students encounter in making the transition vary from student to student. As a result, every student or potential student cannot be treated in the same manner. The varied backgrounds, interests, abilities and goals compel educators to consider each student as an individual with unique characteristics. The educational program, from recruitment through the student's completion of the program, should be flexible to allow for these differences.

Communication between institutions is essential to managing the transition of the student from a secondary program to a post-secondary program. A recognized two-way channel of communication for informing, developing, analyzing, evaluating, and interpreting all matters relevant to the education of the student should be established through cooperative efforts by the secondary and post-secondary institutions. This channel should be established for use by faculty, students, administrators, admissions officers, and counselors of both secondary and post-secondary programs. When a channel of communication does not exist, the post-secondary institutions should take the initiative in organizing and maintaining this channel of communication activities in the absence of efforts by the post-secondary institutions.

It is essential that formal, written articulation arrangements between secondary and post-secondary institutions concerning all phases of the educational system be established in order to provide well coordinated educational opportunities for the student. Working articulation arrangements should be established for horizontal and vertical articulation between and among educational institutions. These arrangements should be developed on a local, regional and state basis and should be commonly understood and utilized by the secondary and post-secondary institutions. As conditions and programs change, these articulation arrangements should be reviewed and adjusted to provide a smooth transition for the student from secondary to post-secondary programs.

Another factor in managing the transition of the student from secondary to post-secondary institutions which provide a progressive sequence of learning experiences for the student enrolling in a program at the post-secondary institution similar to the program pursued in the secondary

institution. The curricula for the secondary and post-secondary programs should be organized so that a minimum duplication of courses for the student exists in progressing from one educational institution to the next. Students should be permitted to enroll in a program at the level they are capable of performing, whether at an advanced level or a developmental level, and proceed through the program to completion. Cooperative efforts by the secondary and post-secondary representatives should be utilized in the development of curricula for the programs in the secondary and post-secondary institutions.

One of the most important aspects of an articulated educational program is the coordination of secondary and post-secondary occupational programs. The lack of coordinated occupational programs between the secondary and post-secondary institutions results in fragmented programs for many students. As a result, the occupational skills and knowledges obtained by the student in the secondary schools are not always applicable to his chosen occupational program in a post-secondary institution. Institutions should develop cooperative plans for utilizing, to the fullest capacity, occupational programs, faculties, facilities and equipment. This should include offering classes at night and other times such that adults who are working full-time or part-time will have the opportunity for retraining or updating of their occupational skills.

Alternative solutions to articulation problems have been stated in the suggested guide, Student Articulation Between Secondary and Post-Secondary Education, in the form of Operational Procedures and Methods of Implementation. Some alternative solutions of articulation problems encountered in managing the transition of the student between secondary and post-secondary institutions include:

A program articulation committee consisting of representatives from secondary and post-secondary institutions should meet regularly to discuss and develop uniform program policies, procedures, requirements and curricula. This committee should be utilized to consider problems the student has in making the transition from high school to a post-secondary institution and identify articulation solutions to these problems.

Whenever feasible, secondary and post-secondary institutions should utilize the same employer advisory committee. If this is not possible, at least one employer representative should serve on both the secondary and post-secondary employer advisory committee for each occupational area. This would help in coordinating the occupational programs at the secondary and post-secondary institutions.

Secondary and post-secondary faculties should cooperatively develop curricula that are complementary and involve a minimum amount of duplication of course work. The curricula should be as individualized as possible and designed such that the student can progress through successive stages at either secondary or post-secondary institutions

with a minimum amount of duplication of effort.

Secondary and post-secondary institutions should organize the curricula into small learning modules. Performance objectives should be designed for progress through the module, the course and ultimately the program by the student. Student entry into the program should be at whatever stage or module the student is capable of performing.

Secondary and post-secondary institutions should utilize some form of record keeping to document the students' competencies as they progress through each education program. A skills and competency check list signed by each instructor would be one method of keeping up with the progress of the student. The skills and competency check list completed at a secondary institution could be used for placement into a post-secondary occupational program.

Information such as job availability, possible locations of employment and the average starting salaries should be included in brochures developed by post-secondary institutions describing the opportunities and program requirements of each occupational program. Post-secondary institutions should strive to make women aware of the opportunities in careers which have normally been considered to be for men only and vice versa.

Where virtually no coordinated articulation arrangements exist between and among institutions, articulation workshops or seminars should be held between secondary and post-secondary institutions to establish working articulation arrangements.

Representatives of post-secondary institutions should meet on a regional and/or state-wide basis to consider articulation problems at the local, regional, and state level. This activitity should be coordinated by a representative of the state education agency responsible for supervising articulation activities.

A coordinated plan between secondary and post-secondary institutions should be developed for the joint utilization or sharing of the facilities and equipment required for expensive occupational programs. Through cooperative agreements a plan could be devised allowing for joint purchase and use of equipment or the use of employer owned or operated facilities.

Secondary and post-secondary institutions should cooperate to provide inservice training for instructional and related staff. Workshops, seminars and methods of teaching developmental programs should be offered by the post-secondary institutions and be available to both secondary and post-secondary instructors.

Secondary and post-secondary institutions should cooperate in determining the service area in which new occupational programs should be established. Factors such as expense, availability to students, physical facilities and employer needs should be considered in making this decision.

As evidenced by the problems and alternative solutions cited above, an essential phase of providing articulated educational programs for the students involves the management of the transition of the students between educational programs. Included in the realm of management is the provision of vertical and horizontal articulation activities.

If the problems incoming students encounter in moving from one institution to another are decreased, the students will have a better psychological and, in many cases, educational base from which to pursue their educational goals. A student who has not been rejected or "turned-off" by the "system" will be willing to put forth an extra effort in pursuit of career objectives.

Transition management should be a concern of both secondary and post-secondary personnel. Communication and cooperation between secondary and post-secondary representatives must exist and flourish. The management of the transition of the student between institutions and programs should be complementary to the student's success. Secondary and post-secondary institutions should strive to eliminate as many "road-blocks" to the student's entry into an educational program as possible without decreasing the quality of education offered to the student.

CONCLUSIONS

The utilization of core curriculums covering occupational clusters great promise for the reformation of the educational system in the United States. However, the implementation of the occupational cluster concept into the educational system will present unforeseeable problems. These problems will affect the success of the cluster concept. Problems will arise in curriculum development, program implementation, teacher preparation, and all other phases of education. These problems will affect the transition of the students from one educational mode to another.

Imbedded in the implementation of the occupational cluster concept is the responsibility of all educators, in both secondary and post-secondary institutions, to coordinate their efforts to provide an articulated educational system for the students. These efforts must be concerned with vertical as well as horizontal articulation.

Although on the surface the articulation problems may seem to change with the implementation of the occupational cluster concept, the basic underlying principles of the problems remain the same. The alternative

solutions of these problems may vary to an extent, but the basic principles for solving the problems will remain. Communication and coordination between and among educational institutions must exist and be encouraged in all phases of the educational system.

Implicit in Ken Hoyt's generic definition of career education (i.e. "...the totality of educational experiences through which one learns about work.") is the need for these educational experiences to be encompassed in a well-articulated framework. These educational experiences should assist the student in proceeding toward career goals with a minimum amount of duplication of effort.

INTERNATIONAL PERSPECTIVES ON CLUSTERING

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Introduction

The seminar paper is only a brief outline. It is intended to highlight the main points to be covered in the seminar. First, it will identify the nature of the interest in job clustering in Europe. Second, it will discuss the reasons for the European interest in clusters. Third, it will illustrate some applications of a curriculum rationale. Fourth, it will describe an analytical approach to the search for cluster phenomena. Finally, it will attempt some conclusions and implications for the domestic scene.

The Nature of Interest in Job Clusters in Europe

The term "career education", with all of the implied or derived meanings attached to it in the United States, does not exist in Europe. But there are so many parallels in Europe that it would be foolhardy to ignore them. There is much talk of the "career value" of education and the traditional differentiation which has existed between general and vocational education is increasingly questioned.

Nor is the term "job clusters" heard commonly in Europe or read in their literature. Terms used more frequently are "families of occupations" or "key qualifications" employed in multiple occupations.

Interest in these concepts is not solely, perhaps not even mainly, in the school systems. More often the interest is in Departments of Employment or in Departments of Planning. These departments are either more flexible or more responsive to the pressures of external force. The most significant external force of the past five years was the student activist movement. It touched every European country and the marks of its impact are clearly evident. School reform will be one of its consequences, although the specific nature of the reform is not yet clear.

Although European education is increasingly career oriented, this emphasis is not provoked by high youth unemployment, the need to redress the disadvantaged, nor any of its American corollaries. More often one hears that an economic corollary is the need for increasing competitiveness within the Common Market or between the Common Market and other regions.

It would be almost impossible to visit an instructional facility in Europe to view illustrations of instruction employing clusters of occupational

"family" approaches. But it would be easy to identify the research underway or hear discussions on the problem. A number of publications on the subject have emerged from the Council of Europe and European educational leaders are well aware of the mounting level of interest among their colleagues.

Reasons for European Interest in Job Clusters

The concept of "occupational families" or job clusters is among the most researchable in the array of problems associated with career education. Europeans have begun this research and it has opened a new dimension to educational discussions. Among the propositions now available for widespread discussion are the following:

1. From the standpoint of the individual, the most important question is the career value of education, or its usefulness for economic security. From the standpoint of society, the aim is to avoid educational investment which is incompatible with economic policies pointing toward growth and full employment.

2. Institutional preparation (levels and specialties) must be reviewed to insure that the issue of educational utility is not excluded from any school. Questions which educational planners ask of labor market and vocational researchers must now penetrate even those schools which have hitherto set their own curriculum requirements based primarily on academic and cultural criteria.

3. Instruction in "key qualifications" is necessary to confer:

    (a) the ability to perform alternately or simultaneously a wide range of jobs and functions, and

    (b) the ability to adjust to a series of (largely unforeseeable) changes in the demands made by one's job throughout one's life.

4. Skills and competencies which at one time were attributed (rightly or wrongly) to the traditional academic subjects are probably peculiar, in this last third of the 20th century, to a completely different set of subjects (vocational subjects) which are still far from finding their place in the curricula of the educational system.

These are propositions being given widespread discussion and debate. They form the basis for the educational reform now underway.

Applications of a Curriculum Rationale

The concept of "key qualifications" has been developed in studies commissioned by the Council of Europe. It is a curriculum development concept serving as a prerequisite to discussions of occupational clustering. Qualifications described as "key" are those which enable an individual to come to terms with reality in an environment which is rational, human, creative, flexible, and which offers many options. They are of equal value in an employment situation which is flexible and full of variety. They include such items as the following:

1. ability to continue learning throughout life
2. ability to change roles in society
3. abstraction
4. creativity
5. connecting theory and practice
6. grasping technical questions
7. analysis of interests
8. capacity for planning
9. communication and decoding skills
10. ability to add to one's knowledge
11. to divide up and utilize time and resources
12. to set self objectives
13. to work with others
14. to perservere
15. to be accurate
16. share responsibility
17. adapt
18. take pleasure in accomplishment

Since such lists are not useful in curriculum development, the types of skills embraced by such lists have been organized within four categories

regarded as "key". They are as follows:

(a) Basic or Vertical Skills -

Common cores linking separate skills, cores which facilitate the transfer of abilities.

(b) Horizontal Skills -

Skills designed to insure that individuals can use the entire stock of available information with maximum efficiency. Qualifications of this type facilitate the horizontal transfer of abilities.

(c) Multi-Purpose Skills -

Special knowledge and skills which have proved their practical usefulness over a wide range of work situations.

(d) Vintage Skills -

Skills which help to eliminate differences in education between generations or time spans.

Applications of the first three categories of key qualifications are illustrated in Tables 1, 2, and 3.

Table 1 - Basic Skills

Basic Skill	Specific Forms	Traditional Vehicle or Subject	Career Topic*
Logical Thinking	Logical conclusions	Formal logic, algebra	Work values and their consequences
Analytical Process	Analysis techniques	Linguistics, analytical geometry	Self-analysis and world of work identity
Critical Thinking	Skill in argument and discussion	Dialectics	Persuasion in role playing
Structural Thinking	Classification	Hierarchy of phenomenon	Taxonomy of occupational ladder
Systematic Thinking	Adjustment of ends to means	Theory of organization	Study of local bureaucracy
Cooperation	Rules and techniques of social games	Specific games	Youth organizations
Conceptual Thinking	Readiness and ability to plan ahead	Planning techniques	Career planning
Decision-Making	Assessment of risk and chance - ability to decide	Game theory, decision theory	Career choice
Creativity	Association of ideas	Brainstorming, morphology	Student governance
Contextual Thinking	Understanding of connections and interdependence	Chess, techniques of master plans	Labor relations

Table 2 - Horizontal Skills

Horizontal Skill	Specific Forms	Vehicle or Subject
Data on data	(a) Nature of data	General study of data
	(b) Procurement of data	Study of libraries, media statistics
	(c) Comprehensiveness of data	Study of symbols, programming languages, drawings, models, sounds, and signals
	(d) Processing of data	Technical plans and instructions. Using data machines, practice in self-expression, rapid reading, using references.

Table 3 - Multi-Purpose Skills

Multi-Purpose Skill	Specific Form	Vehicle or Subject
Measuring techniques	Standards of measure	Study of instruments
Persuasion	Argument and debate	Speaking and interviewing
Entrepreneurial Skill	Resource management	Choosing and analyzing alternative paths
Bureaucratic Skill	Acceptance of bureaucratic style	Local community study
Life-Preserving Skill	Risk reduction	Safety instruction
Mechanical Skill	Using tools	Occupational tool study

Search for Cluster Phenomenon

The use of occupational clusters for organizing instruction has occurred in Europe as in America, by attempting an empirical delineation of occupations into natural groupings for instruction. Instructional use is limited and it will continue to be so until the concept is more fully explored.

Meanwhile some interesting research is underway to ascertain a more durable empirical base for examining the cluster phenomenon and its relationship to both training needs and the employment market. This can best be described by illustrating the traditional approach to manpower planning in most western countries as shown in Figure 1.

Figure 1

A	A^1	A^2	A^3	A^4	A^5	A^N	Market
B	B^1	B^2	B^3	B^4	B^5	B^N	

$A - A^N$ can be described as jobs for which people are being trained and $B-B^N$ can be described as the training needed for specific kinds of employees by the labor market. Thus A^1 may describe the welders being trained and B^1 describes the welders needed by the labor market.

In this traditional approach, each pair A - B represents a separate labor market uneffected, presumably, by other markets. The evidence of labor market behavior does not, of course, support such a conclusion. There are many possibilities for substitution and much mobility in the market place.

Research in West Germany was prompted by the evidence that half of the working population changed from one occupational category to another in a lifetime. It prompted the following questions:

1. Between what occupations do changes occur more or less frequently?
2. How many occupations are open to a given type of training?

   Which occupations?
3. If changes are disfunctional, how great is the disfunction?
4. What kinds of training aids mobility?
5. Does job substitution work both ways, is it reversible?
6. When does substitution entail considerable expense (retraining) and when is it free?
7. Is there overlapping training or job content in jobs more easily substitutable?

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8. Are women substitutable for men or vice versa?

Answers to these questions are now becoming available. Further research of this type has been commissioned to discover its further bearing on education and training. It is an approach to employing labor force behavior in determining a rationale for clustering and not merely the preferences of those engaged in education and training. It is considered an input from the demand side as well as the supply (training) side of the manpower market.

Conclusions and Implications

European attention to concepts related to career education are probably wide ranging and significant as are found anywhere. Concern is for policy direction as well as educational and training practice. Human resource policy is at the center of most discussions and the foundation for most of the research. A balance between the needs of the individual and the needs of the economy is a pivotal consideration in all work undertaken.

Research contributing to the concept of "job families", mobility, substitution, and clustering is undoubtedly the center of attention for research and planning. In Europe the discussion is not merely of having "career" education invade the academic curriculum, it is also in having basic, horizontal and multi-purpose skills invade the vocational curriculum.

Perhaps the most important conclusion that can be drawn from the observation of European efforts is that concentrated attention is being given to career education in Europe, although not entirely in the same context as one finds in America. The European attention is instructive and revealing. Coordination and interaction with European agencies and individuals should now be regarded as an imperative for Americans and American agencies working in this field. Moreover, the research completed and underway in Europe should become a part of the reservoir of information available to the research community in the United States. The European research, or variations of it, could contribute immeasurably to the further clarification of the rationale for career education, its curriculum development and its illumination in the United States.

THE MANPOWER EDUCATION EFFORT IN CLUSTERING

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Organizing training programs using occupational skills clusters has added flexibility to the manpower institutional training program. This method of program organization has been adopted to a limited degree in skills centers and in large multi-occupational training programs.

Occupational training in manpower programs operates in a different climate than other educational programs sponsored by State or local education agencies. These differences have influenced, and in some cases, modified, the development of occupational clusters and their application in manpower training programs. Several of these influences are briefly described in order to review some of the limitations to the universal application of occupational clustering.

Manpower programs have generally been constrained by limited budgets. Therefore in an effort to serve as many individuals as possible, it was the practice to fund those occupations that require shorter training periods (6 months or less) rather than longer ones (1 or 2 years).

In addition, in FY 1973, 58 percent of the trainees met the Department of Labor definition of disadvantaged.1/ Many have had some experience in the labor force although much of this experience was in jobs requiring little or no preparation of training.

The development of the cluster approach in manpower training arose when the trainee population changed from the technologically displaced to the disadvantaged. It was envisioned as a vehicle to give trainees a broad overview of a variety of occupations since many trainees had only a limited view of the labor market and were unaware of the variety of jobs available within general occupational areas. The introduction of occupational clustering to manpower training programs also resulted in the development and implementation of related concepts, such as open-entry/open-exit scheduling, the employability team approach, and learning packages. Course offerings in related occupations are clustered in order to accommodate individual learning abilities, aptitudes, and desires. Clustering is part of the continuing effort on the part of the Division of Manpower Development and Training to refocus education on serving the needs of the student or trainee rather than having the trainee serve the needs of the institution or the instructor.

*(At the time of presentation, Miss Donovan was Deputy Director, Division of Manpower Development and Training, USOE.)

1/ For manpower program purposes, a disadvantaged person is a poor person who does not have suitable employment and who is either (1) a school dropout, (2) a member of a minority group, (3) under 22 years of age, (4) 45 years of age or over, or (5) handicapped.

However, it should be pointed out that the manpower concept of clustering centers on entry level skills and does not purport to turn out finished craftsmen or technicians in all of the specific occupations comprising a particular cluster.

Definition of the Occupational Cluster

In manpower training programs an occupational cluster is defined as a group of occupations sharing a common core of experiences and knowledge with provisions for horizontal or vertical mobility or both within the occupational cluster.

The occupational cluster embodies a number of related concepts. These include:

1. Occupations in a cluster are those requiring the largest number of common elements in such areas as equipment, materials, communication, computation, related information or processes, and cognitive and manipulative skills.

2. An occupational cluster offers the maximum flexibility in admitting, guiding, motivating and evaluating the individual trainee.

3. Occupational training content that is controlled by certifying agencies and requiring a specific number of hours of training and qualifying examinations (e.g., Licensed Practical Nurse or cosmetology) can be accommodated within the open-entry/open exit portion of the cluster.

4. Curriculum patterns should be compatible with the open-entry/open-exit pattern of scheduling.

Descriptions of the Manpower Cluster Concept

In 1970 a conceptual model of an occupational cluster was developed and disseminated to the regions and States by the Division of Manpower Development and Training. This model is shown in Attachment A. Each occupation in the cluster consists of a common core of activities, unique job components, units and specialized job levels. Basic education may be offered concurrently with occupational training. Certain units and specialized job levels may be included in more than one occupation. It is desired that each trainee reach his capability level, and therefore, assessment at each step to determine the capability plateau of each trainee is essential.

The occupational cluster broadens the options of the individual trainee through its provision for vertical or horizontal mobility. Thus a trainee is able to progress directly toward a single occupational goal or to acquire those skills that would prepare him for employment at several jobs within the occupational cluster.

As an individual progresses through the training program, the initial training period is directed to acquisition of the basic skills and activities that are common to the several specific occupational skills within the cluster. These are also referred to as job component activities and comprise the basic tasks or units of instruction. Generally, trainees enrolled in a cluster are exposed to or are aware of all the components and activities at the job component activities level. At the next level are units or tasks, which are groups of related activities that comprise a specialized exit level. Should a person terminate training upon completion of several of these tasks or units, he would be prepared for employment in a specific area within the occupation. At the specialized exit level the trainee is prepared to find employment within a specific area of the occupation or progress to the occupational level. It is at this level that those trainees who are continuing training to the next level may begin to select anly those units of learning that prepare them for their ultimate occupational goal. Trainees who reach a specialized exit level in one occupation who decide to change their occupational level goal may do so by picking up the required units and then proceeding. The occupational level is that point within the cluster that permits trainees to qualify for employment in a specific occupation. They also have the option of selecting employment at the specialized exit level should the condition of the labor market so dictate. They have the advantage of qualifying for several specific jobs within an occupational area and thus clusters may provide for vertical and horizontal mobility within the labor market.

Techniques and Approaches Used in Implementation of Manpower Cluster Concept

Occupational clusters operate most effectively when combined with an open-entry/open-exit enrollment policy, which permits a trainee to enter a program at any time (or at specified internals, such as weekly); progress as quickly as ability permits; and, complete training upon achievement of the stated training objectives. Such programs require trainee appraisal at each level of experience so that the trainee may progress from one level of the cluster to the next as his capabilities, aptitudes and competencies dictate. In an open-entry/open-exit program, trainees are able to leave the program when they are job-ready, either at the occupational level or at the specialized exit level, and not merely because they have completed a specific number of hours of training, but because they are job ready. There is continuous appraisal of the trainees' progress measured by completion of specified training tasks and by conferences with instructors and counselors. In addition each trainee from the onset has a clear understanding of the objectives and goals to be achieved by participation in the program as well as responsibility for attainment.

The open-entry/open-exit instruction concept has also required a different approach in teaching techniques and in the design of learning materials. The learning package is an innovative method of meeting this need. A learning package is an instructional component designed to enable the learner, or learners,

to achieve a specific learning objective. It is usually designed for self-study or individual learning but it can be used for small group learning. The learning package actively involves the learner by incorporating in the learning materials a wide variety of instructional media. Learning packages have been developed in each skill cluster area for use by instructors and trainees. Learning packages for a particular occupation cover a wide range of skills and abilities that are required within the occupational area. The materials are so structured that the trainee uses only those learning packages that contribute directly to those skills he must master. An assessment of the trainee's competencies indicate those areas that the trainee has already mastered and those in which additional instruction must be provided.

The variety of trainee aptitudes, interests and abilities has also fostered the development of job ladders within each occupational area offered at skills centers and large multi-occupations training programs. Examples of several of these ladders that are in operation at Oklahoma City Skills Centers are included in Appendix A. Curriculum materials are so structured that trainees who are able to complete only a limited period of time in the program will emerge from it with a saleable skill. Those who complete a total training program will also have attained a variety of skills and knowledge about the various job opportunities within an occupation.

The learning laboratory is another important element in occupational clustering in manpower training centers. Such resources permit the development of specialized audio-visual materials in various areas of the cluster that are completely tailored to the requirements of the instructional program at the center. Such materials may be used to introduce the trainee to the cluster and the various occupations that are available to him or to impart specific instructional materials.

Manpower Development and Training Skills Centers: An Approach to Clustering

The criteria for skills center designation require that training programs offered at a skills center should, as a minimum, include three occupational clusters, with at least three occupational offerings per cluster. As long as the center maintains cluster training emphasis it may also provide single occupational projects as needed.

The cluster concept provides trainees with several options for employment within a given field and gives them a broader familiarity with an occupation then they could readily obtain otherwise. It provides a wider range of job choice. For greater program flexibility and operational efficiency, the open-entry concept, which means that trainees can enroll at almost any time and can end training when they have achieved their goals, is incorporated into the basic occupational cluster plan. Open-entry/open-exit scheduling and occupational clusters afford a type of flexibility not readily attainable in single or small projects. They accommodate the different rates at which enrollees proceed and permit job placement when the individual has reached his goal for employment. Moreover, since

trainees enter the labor market when they are job ready, usually one or two at a time rather than a graduating class of 15 or 20, flooding the labor market with job applicants is minimized.

The following chart shows some of the most frequently reported clusters currently in operation.

FY '73 Skills Center Clusters

269 Clusters Reported
60 Automotive
69 Clerical
28 Food Service
12 Health & Medical
27 Welding

Staff and Program Implementation

In implementing the cluster concept and the open-entry/open-exit enrollment policy, the wide range of individual competencies of the trainees makes the qualifications for manpower teaching and counseling very demanding. The instructors must be able to take a group of people with very different abilities and levels of aspirations, from widely diverse backgrounds and provide each of them with a program of individual instruction so that the trainees may make maximum use of their capabilities.

It is of the utmost importance that the administration and staff of an institution implementing the cluster concept not only know how to cluster occupations but also understand and accept the reason why this effort is being undertaken. In order to insure the proper training of staff in the cluster concept and the reason for its implementation, the Division of Manpower Development and Training has supported, since 1968, a major effort to offer staff development workshops and to acquaint manpower personnel with the special needs of manpower trainees, through the establishment and operation of Area Manpower Institutes for the Development of Staff (AMIDS). AMIDS personnel conduct workshops, seminars, and conferences throughout the country in order to provide staff development. These workshops have addressed such topics as diagnosis of individual need', development of lesson plans and course outlines under the cluster concept, evaluation of teacher success and student progress, and explaining team teaching.

Once the basic clustering structure is in place, further refinements can be made to assure that this instructional tool is oriented to individual trainees. One of these refinements is the open-entry/open-exit approach to individualized programming which may be accomplished through time free modular curricula. A time free modular curriculum is a completely individualized instructional program that has no time requirement for completion and in which progress is dependent on the trainees demonstrated performance. Each

Summary

An occupational cluster in manpower institutional training is a group of occupations sharing a common core of experiences and knowledge with provisions for both movement between occupational specialities within the cluster, and for advancement up the skill ladder within any one job specialty. The cluster is built around a common core of activities, which may be completed in an early stage of training or may extend throughout the total program, depending upon the characteristics of the occupation. Occupational clustering

- gives the trainee a variety of learning and practical experiences;
- offers the fundamentals that prepare the trainee to enter occupational training in any unit within the cluster;
- allows the instructor to assess the trainee's aptitude, interest and adaptability to the occupation as early as possible;
- affords the trainee the opportunity to make a self-assessment of his adaptability and desire to continue training in the occupation, or to select another career option in the cluster; and
- provides effective and efficient use of training time.

Although the Division of Manpower Development and Training has worked mainly through the AMIDS system to implement the cluster concept throughout the manpower training system in the U.S., program evaluations reveal that the concept has still not been fully implemented. Most centers have adopted a modified job ladder approach within a single occupation which has the advantages of assuring that trainees leaving the program will have at least minimal skills within an occupation and will be able to obtain employment and that there is some choice for trainees within an occupational area. As limited program resources and reductions in trainee enrollment account for this lack of total acceptance, technical assistance and national conferences sponsored by the Division of Manpower Development and Training will be required in order to fully implement the manpower cluster concept in manpower training programs.

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module within the curriculum is a completely self-contained unit. The open-entry/open-exit method of operation can be put into effect after the course offerings are organized into units of instruction which permit trainees to move from one unit to another within the program. Use of these methods adapts instruction to the trainee and does not force the trainee to adapt himself to a common denominator type of program. This trainee-centered instruction is further strengthened by the use of learning labs, the use of individual referrals to other training institutions to broaden clusters, by counseling, and the use of employability teams.

The employability or "trainee support" team operates each skills center and, in many large multi-occupational projects, the team is the skill center unit responsible for the development of the individual trainee's employment plan; assessment of his progress; and the determination of his readiness for placement. The team is composed of members of the trainee's education and employment service counselors and instructors Each trainee's employment plan is developed within three weeks after enrolment, periodically reviewed, and adjusted as necessary according to the trainee's progress and needs. Adjustments to employment plans may include transfer to other occupational training areas or extension of training, etc.

Some Examples of Manpower Clustering

The Cherokee Hills Rural Center, Oklahoma conducted training in the health occupations cluster, clerical occupations, and mechanical occupations cluster for 245 trainees.

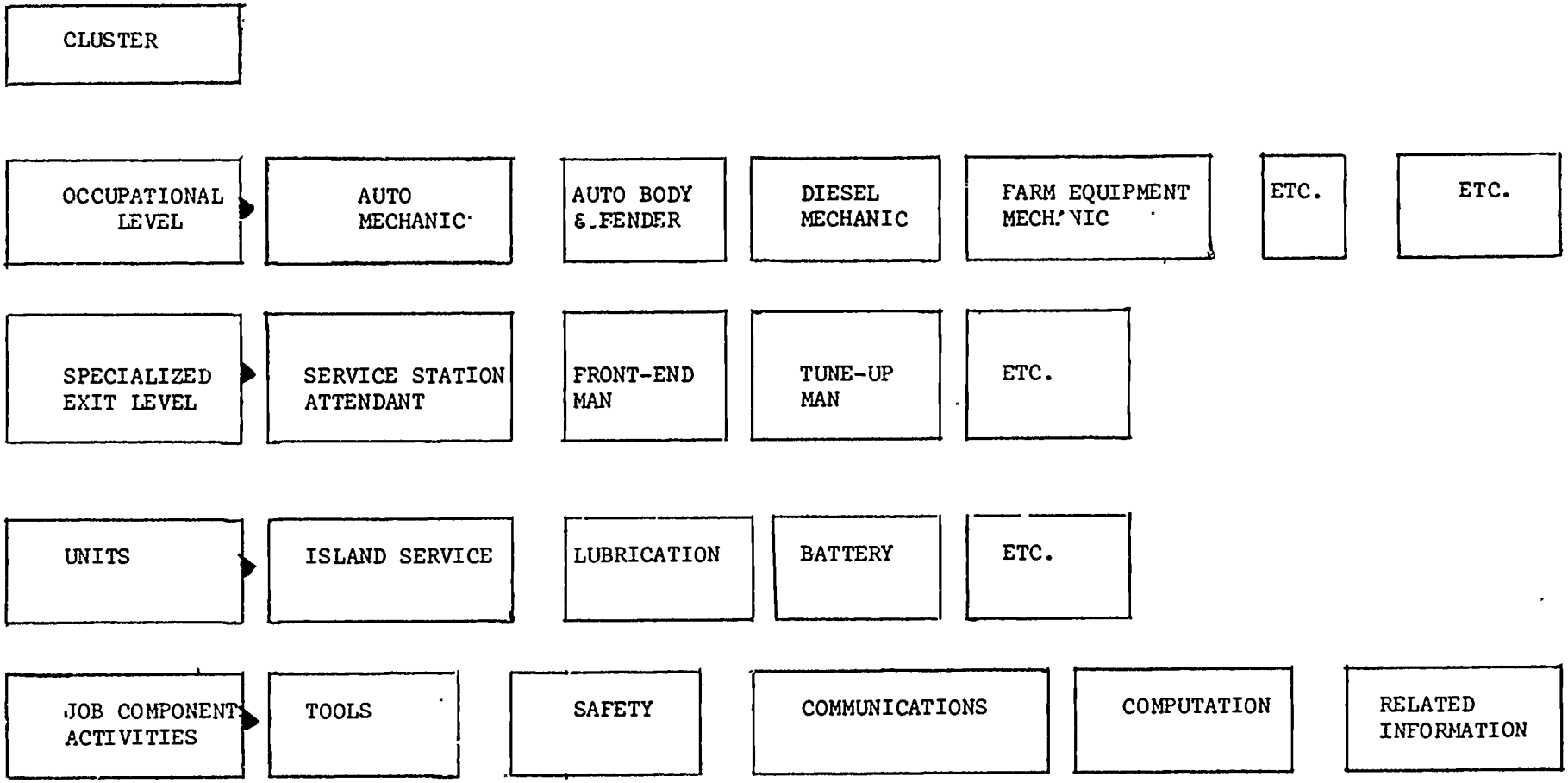
The Alabama State Department of Education completed a "Time-Free Modular Curriculum." This project,for the clustering concept, updated existing materials into modular curricula--free from normal time constraints. This project was originally developed for Project Transition, in 10 of the most frequently offered occupations. These curricula will also be useful at skills centers, OICs, etc., and include supporting audio-visual teacher training films. Time-free modular curriculums have been completed for the following occupations: engine tune-up;front end and brakes; transmission; auto service technician; auto body; welding; radio and TV repair; drafting; electrical appliance repair; and refrigeration and air conditioning. The following additional occupational areas are now being developed: accounting; clerical skills; secretarial skills; industrial electricity; electronics; diesel mechanics; cosmetology; practical nursing; solid waste operator; and, liquid waste operator.

The State of Wyoming is developing audio-visual materials adapting occupational clusters to use for guidance and training in manpower training programs. The concept consists of identifying occupations with common skill content and training for these occupations as a group.

APPENDIX A

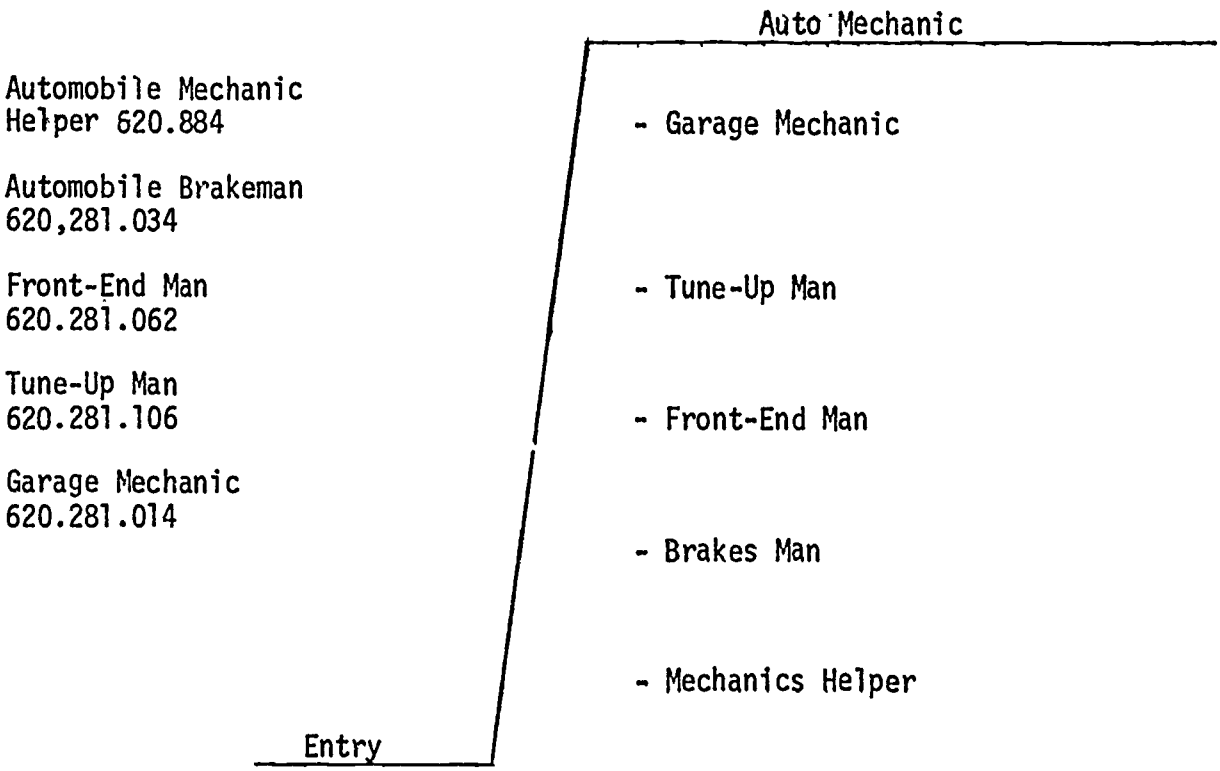
CONCEPTUAL MODEL FOR DEVELOPMENT OF AN OCCUPATIONAL CLUSTER

Motor Vehicle Cluster



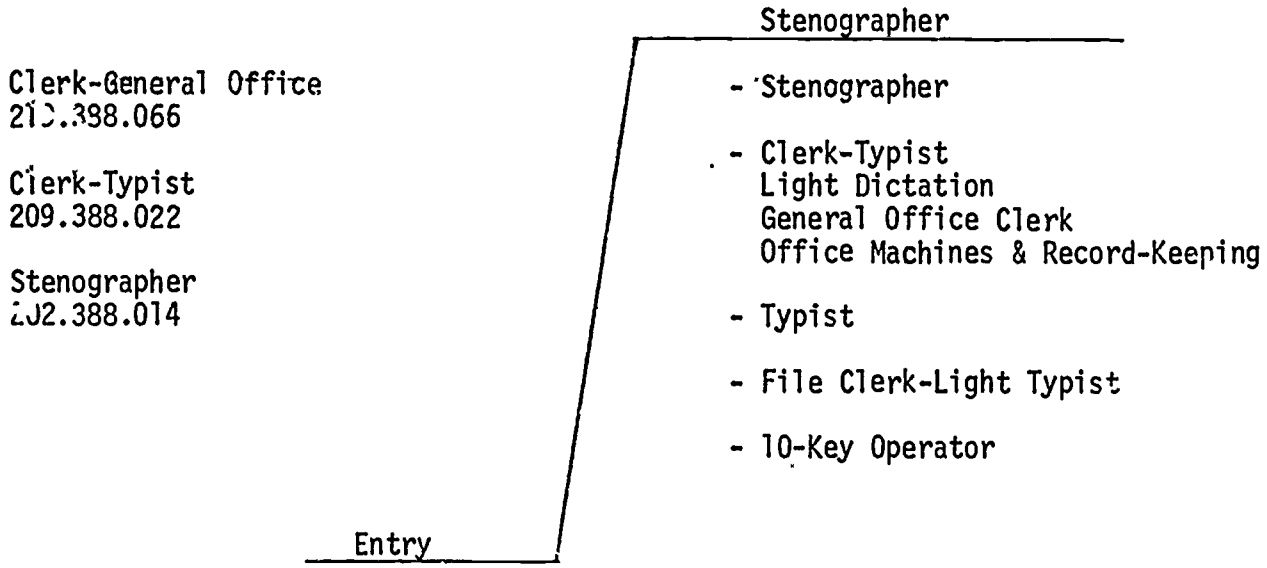
APPENDIX B
JOB LADDERS AT OKLAHOMA CITY SKILLS CENTER

AUTO MECHANICS JOB LADDERS



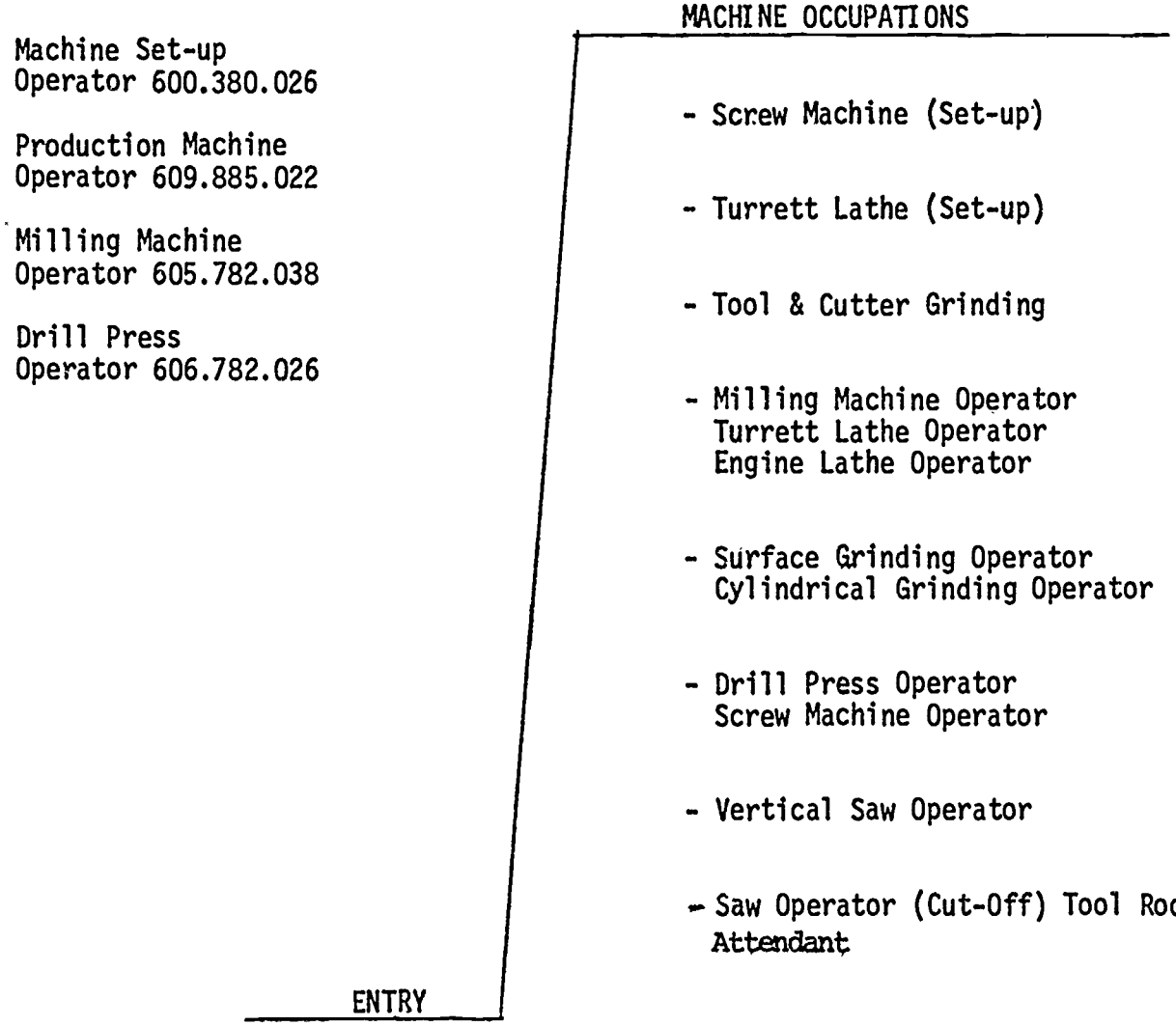
APPENDIX B - (Continued)
JOB LADDERS AT OKLAHOMA CITY SKILLS CENTER

CLERICAL JOB LADDERS



APPENDIX B - (Continued)
JOB LADDERS AT OKLAHOMA CITY SKILLS CENTER

MACHINE SHOP JOB LADDERS



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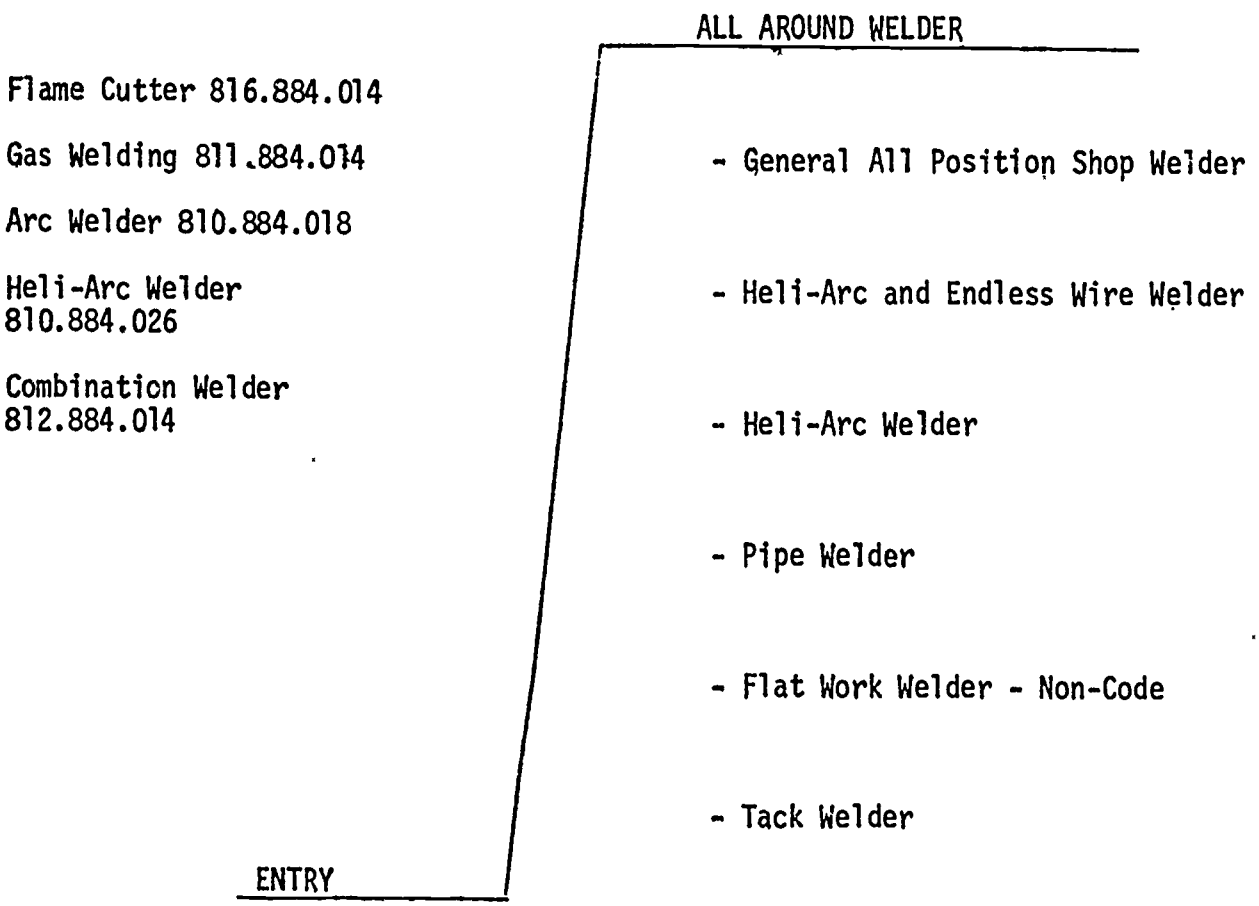
APPENDIX B - (Continued)
JOB LADDERS AT OKLAHOMA CITY SKILLS CENTER

WELDING JOB LADDERS



CAREER EDUCATION

Career Clusters - Explanations and Concepts

Sherrill C. McMillen

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Division of Vocational & Technical Education
U.S. Office of Education

Note:

This presentation on Career Clusters was prepared for discussion by an Ad Hoc Committee on Career Clusters, instituted by the Bureau of Occupational and Adult Education of the Office of Education. The committee included members of the BOAE staff and representatives of the Bureau of the Census, the Department of Labor and the National Center for Educational Statistics. The responsibility of reexamining the cluster concept, evaluating its utility as an organizing base for curricula to prepare workers for the full range of occupations listed in the OE publication, Vocational Education and Occupations, was given to the committee. As a result of the investigation, the committee recommended realignment and modification of several clusters to provide for w what they felt was a more realistic grouping of occupations. Inclusion of this paper in this monograph does not constitute official policy of the U.S. Office of Education.

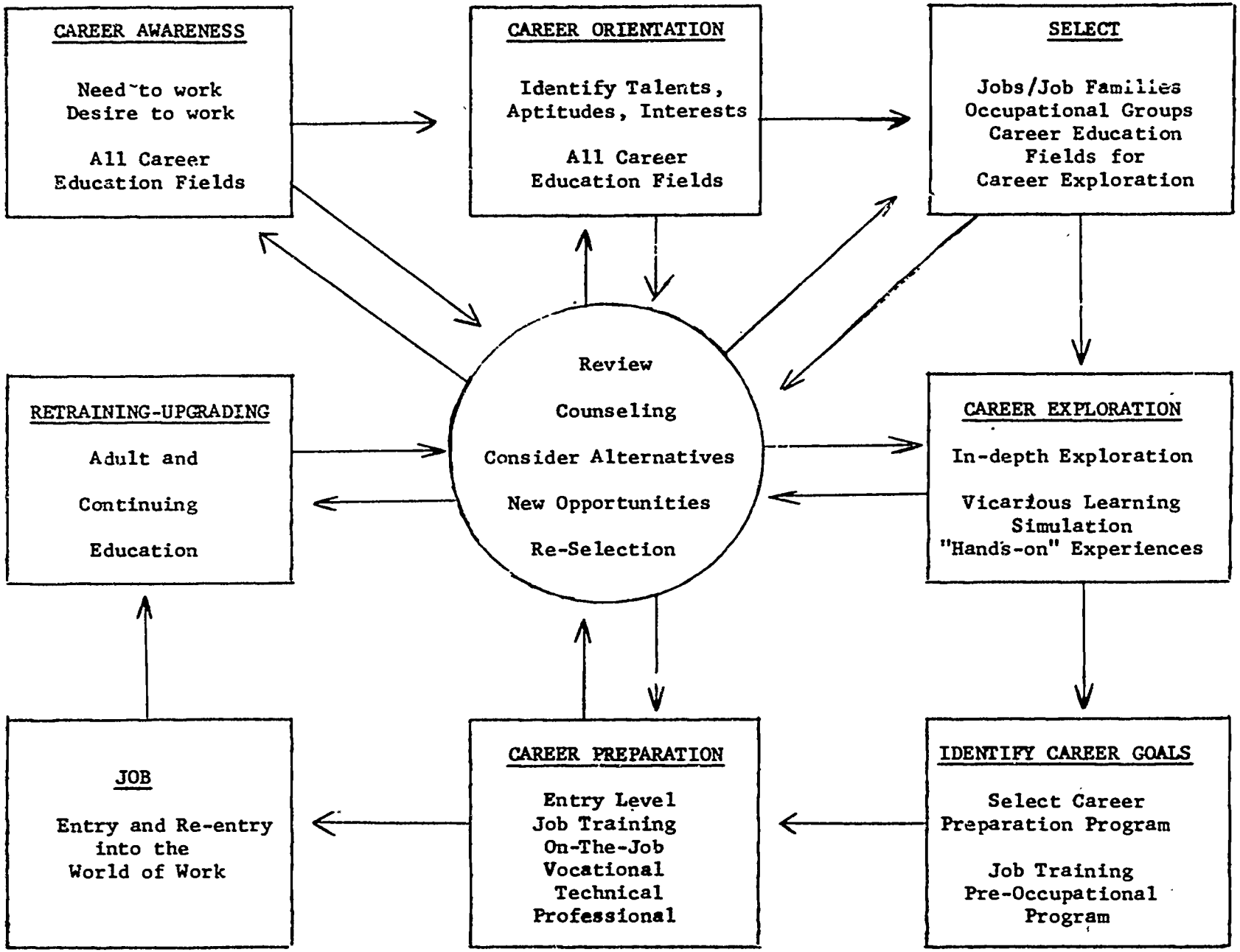
CAREER EDUCATION

Career Clusters - Explanations and Concepts

Career education may be described as consisting of four phases. Each is described briefly below. The entire career education program is shown pictorially on page 86. Frequent references to the chart will serve as an aid to understanding the materials.

Phase I - Career Awareness

Career Awareness is the process of providing the child with information necessary to understand the need for all people to function in the world of work and form the desire to do so. The child should also gain a respect for all work and for people who work. The process of Career Awareness should begin with parental guidance as soon as the child is able to understand the concept of work and be continued by the parents, teachers and counselors, in a more formal atmosphere, through elementary school years, K-6. (NOTE: Grade levels indicated with respect to the phases of career education are intended to show only the normal time occurrence of each phase in a student's educational career. To provide for individual differences, grade level indications must not be interpreted as being restrictive.)


CAREER AWARENESS
Need to work
Desire to work
All Career
Education Fields
CAREER ORIENTATION
Identify Talents,
Aptitudes, Interests
All Career
Education Fields
SELECT
Jobs/Job Families
Occupational Groups
Career Education
Fields for
Career Exploration
RETRAINING-UPGRADING
Adult and
Continuing
Education
Review
Counseling
Consider Alternatives
New Opportunities
Re-Selection
CAREER EXPLORATION
In-depth Exploration
Vicarious Learning
Simulation
"Hands-on" Experiences
JOB
Entry and Re-entry
into the
World of Work
CAREER PREPARATION
Entry Level
Job Training
On-The-Job
Vocational
Technical
Professional
IDENTIFY CAREER GOALS
Select Career
Preparation Program
Job Training
Pre-Occupational
Program

Phase II - Career Orientation

Career Orientation is the process by which the students are assisted in orienting their talents, aptitudes and interests with respect to the world of work. The student will receive information as to the structure of the fifteen career education fields including the entry level jobs available within each, and the career ladders within each cluster. The phase will normally occur in grades 7 and 8 after completion of Phase I.

Phase III - Career Exploration

Career Exploration is the process in which a student explores a number of jobs and/or families in preparation for choosing one of them for Phase IV intensive skill training. It should be noted that the Phase Phase II processes imply a teacher, counselor, parent centered approach to motivating and orienting the student in the world of work. Phase III should be a student centered approach where he explores his choices with the teacher acting as a "Coordinator of Experiences" rather than as a teacher in the usual sense. The counseling function should be to provide the necessary counseling toward an intelligent choice for intensive skill training.

Phase IV - Career Preparation

Career Preparation is intensive skill, technical knowledge, work habit, attitude and safety training in one job or job family, preparatory to job entry. This preparation may be gained in high school cooperative or in-school programs, private and public post-high school programs, correspondence courses, adult education programs, technical institutes, and community colleges, four-year college programs and post-graduate university programs.

CAREER CLUSTERS

The U.S. Office of Education, in setting forth the "career education" concept, illustrates the world of work by grouping the occupational functions of the nation's labor force into fifteen broad areas called career clusters.

Each career cluster is sub-classified into one or more occupational groups, each group representing specific occupational functions. Occupational groups are broken down into one or more job families, each of which is composed of jobs that have identical or similar skills and knowledge requirements.

For purposes of this discussion a career cluster may be specifically defined in terms of (1) career field, as related to the awareness, orientation, and exploration phases, and (2) career preparation, as related to actual education and training leading to employment.

1. Career Field

   A broad general grouping of occupations based upon the functional structures and processes of identical or similar elements or characteristics peculiar to the cluster.

   The career field definition of a career cluster is used to identify a listing of all occupations offering employment opportunities within the cluster and may overlap or duplicate in two or more clusters. For example, secretaries, nurses, truck drivers or bookkeepers may be listed as employed within several of the clusters but training would be offered under a specific cluster.

2. Career Preparation

   A specific classification of occupational, technical and professional programs grouped together on the basis of identical or similar skills and knowledge requirements.

   The career preparation definition as used within each of the career clusters represents the identified listing of occupations requiring specific education and training that is unique or applicable only to that particular cluster. For example, all secretaries and bookkeepers would receive their career preparation as a part of Business and Office regardless of where they are to be employed. All practical nurses, dental technicians, or laboratory technicians would receive their training under the Health cluster even though they may be working in any of the other identified clusters. There would be no overlapping of OE codes and job titles within the 15 clusters as indicated in the career preparation classification.

In the following listing of career clusters, a specific definition is given for career field and career preparation. A listing of occupations related to the modified clusters is included in Appendix A. Occupations are identified by code numbers shown in Vocational Education and Occupations (OE-80061).

CLUSTER COMPARISON

15 Clusters (Original)	Suggested Cluster Modification
Agri-business and Natural Resources	1. Agriculture (including Agri-business)
Business and Office	2. Natural Resources and Environment
Communications and Media	3. Construction
Construction	4. Manufacturing
Consumer and Homemaking Education	5. Transportation
Environment	6. Communications and Media
Fine Arts and Humanities	7. Product Services (Mechanics Repairers)
Health	8. Marketing and Distribution
Hospitality and Recreation	9. Business and Office
Manufacturing	10. Personal Services
Marine Science	11. Hospitality and Recreation
Marketing and Distribution	12. Home Economics (including Consumer and Homemaking Education
Public Service	13. Health
Personal Services	14. Fine Arts and Humanities
Transportation	15. Public Service

Reasons for Suggested Cluster Modifications

The Modifications suggested below retain the 15-cluster concept but modify the original clusters to provide more realistically for the grouping of occupations.

1. Agriculture (including Agribusiness)

   The committee recommends that this cluster be changed to Agriculture (including Agribusiness). The use of the word Agriculture and Agribusiness is still in a changing pattern but until agencies, organizations, and others interested in the total field agree, the word Agriculture still seems to be a more popular usage than Agribusiness. Therefore, it is recommended that the designation be as indicated, Agriculture (including Agribusiness).

2. Natural Resources would be combined with Environment. All of the nonrenewable resources, such as mining, oil, gas and water may directly affect the environment. The same is true with many of the renewable natural resources. The combination of Natural resources and Environment is a more logical cluster and provides a better classification of occupations within the clusters.

7. Product Services (Mechanics and Repairers)

   A large segment of the occupations in the Dictionary of Occupational Titles as well as in the OE classification system could not be listed under any of the original 15 clusters. This includes the broad group of repairmen services on man-made products. The inclusion of the new cluster would provide for the large group of occupations that could not be included under any logical breakout within the 15 original clusters.

12. Home Economics (including Consumer and Homemaking Education)

    Consumer and Homemaking Education is a narrow category included as a section of the Vocational Education Act of 1963, as amended. It does not cover the broad field of Home Economics which originally was intended in this cluster. The committee recommends that this cluster be changed to Home Economics (including Consumer and Homemaking Education) to provide for the broad spectrum of occupations which should be included under this cluster.

Marine Science

The committee recommends that Marine Science be eliminated from the original 15 clusters. Marine Science is not a discrete grouping of occupational areas but belongs in the same classification as Forestry, Science, soil science, and similar groupings are now included under Natural Resources. Marine Science appropriately belongs under Natural Resources and the committee recommends that all of the occupational breakouts for Marine Science be included as a part of Natural Resources and Environment Cluster.

AGRICULTURE (including Agribusiness)

A. Career Field

A grouping of occupations concerned with the science, art, skills, operation and management of farms, ranches, forests, greenhouses, nurseries, including the production of food, feed and fiber; and, in varying degrees, the services and related businesses usually associated with them, including the processing, storage, marketing and distribution of farm commodities; the manufacturing and distribution of farm equipment, fertilizers and supplies; and, the conservation and preservation of soils, trees, water and wildlife.

B. Occupational Preparation

A combination of the skills, knowledge and competencies involved in the operation and management of a producing farm, ranch, greenhouse, nursery, or forest and to employment in the non-production related services and businesses usually associated with them.

NATURAL RESOURCES AND ENVIRONMENT

A. Career Field

A grouping of occupations concerned with the naturally occurring materials of nature having human utility or value. The term includes soil, water, air, plant life, non-human animal life, sunlight, minerals, mineral fuels, and space on land and ocean surfaces; and occupations concerned with man's relationship with his natural and man-made surroundings, such as, air and water pollution, conservation, transportation technology, and urban and rural planning as it effects population and the health of the individual.

B. Occupational Preparation

A combination of subject matter and planned learning experiences including the knowledge and skills essential to employment in mining, mineral extraction, fish, other natural resources occupations and industries, pollution prevention and control, environmental planning and resources control.

CONSTRUCTION

A. Career Field

A grouping of occupations concerned with the erection, installation, maintenance and repair of residential, commercial, industrial and public works facilities or structures.

B. Occupational Preparation

A combination of subject matter and planned experiences designed to assist individuals in developing the knowledge and skill essential to employment in Construction.

MANUFACTURING

A. Career Field

A grouping of occupations concerned with the transformation of raw products, materials and reprocessing of waste products in a useful form.

B. Occupational Preparation

A combination of subject matter and planned experiences designed to assist individuals in developing knowledge and skills essential to employment in the four functions of manufacturing, production, engineering, support, and management.

TRANSPORTATION

A. Career Field

Transportation is defined as a grouping of occupations concerned with the movement of people and/or goods from one place to another, using all means of conveyance, over or through land, sea, aerospace, or by pipelines.

B. Occupational Preparation

A combination of subject matter and planned experiences designed to assist individuals in developing the knowledge and skills essential to employment in intermodal transportation.

COMMUNICATION AND MEDIA

A. Career Field

A grouping of occupations concerned with the transfer of information via the medium of telecommunications or graphics.

B. Occupational Preparation

A combination of subject matter and planned experiences designed to assist an individual in developing the knowledge and skills essential to successful employment in the communication field.

PERSONAL SERVICES

A. Career Field

A grouping of occupations concerned with meeting the needs of the individual for his/her own betterment by rendering a variety of personal services related to the physical appearances of individuals.

B. Occupational Preparation

A combination of subject matter and planned experiences which are similar in nature designed to assist the individual in developing competencies which can be utilized in a meaningful occupation of personal services in such fields as cosmetology, barbering, and physical culture.

MARKETING AND DISTRIBUTION

A. Career Field

A grouping of occupations concerned with creating value for products and services by facilitating their movement from producers to users or consumers.

B. Occupational Preparation

A combination of subject matter and planned experiences designed to assist individuals in developing the knowledge and skills essential to employment in the Marketing and Distribution occupations concerned with selling, sales promotion, buying, marketing research, and marketing management.

BUSINESS AND OFFICE

A. Career Field

A grouping of occupations concerned with the facilitating functions of business, government, and industry in the recording and retrieval of data, internal and external information dissemination.

B. Occupational Preparation

A combination of subject matter and planned experiences designed to assist individuals in developing the knowledge and skills essential to employment in the Business and Office occupations.

PRODUCT SERVICES (Mechanics and Repairers)

A. Career Field

A grouping of occupations concerned with repairing or servicing of a variety of electro/mechanical and other products utilized by individuals.

B. Occupational Preparation

A combination of theory and work experience which have common similarities designed to provide the opportunity for an individual to develop competencies in repairing or servicing electro/mechanical and other products.

HOSPITALITY AND RECREATION

A. Career Field

A grouping of occupations associated with the housing and feeding of people away from home (other than in health care institutions) and the provisions of constructive recreational resources and services--both public and private--related to leisure time pursuits of people away from home.

B. Occupational Preparation

A combination of subject matter and learning experiences drawn from the knowledges, skills an attitudes directly associated with the hospitality and/or recreation functions (s) of an enterprise, such as marketing management, sales and sales promotion, production, maintenance, operators of recreational activities.

HOME ECONOMICS (including Consumer and Homemaking Education)

A. Career Field

A grouping of occupations concerned with food and nutrition, child development, clothing, housing, family relations, parent education, consumer education, and the management of individual and family resources.

B. Occupational Preparation

A combination of subject matter and planned experiences to assist individuals in developing the knowledge and skills essential for the role of homemaker and/or for employment in occupations requiring abilities and knowledge offered by Home Economics and Consumer and Homemaking Education.

HEALTH

A. Career Field

A grouping of occupations concerned with the maintenance of health and with the diagnostic, therapeutic, preventive, restorative, and rehabilitative services relating to the health of people.

B. Occupational Preparation

A combination of subject matter and planned clinical experiences designed to assist individuals in developing skills and knowledge essential to employment in the health services.

FINE ARTS AND HUMANITIES

A. Career Field

A grouping of occupations concerned with the creative and performing arts and their historical basis.

B. Occupational Preparation

A combination of subject matter and planned experiences which are similar in nature and designed to assist the individual in developing competencies in the areas of Fine Arts and Humanities including dance, music, drama, and creative writing.

PUBLIC SERVICE

A. Career Field

A grouping of occupations concerned with the functions necessary to provide services to the public. Will include occupations that are unique to government and similar services in business and industry.

B. Occupational Preparation

A combination of subject matter and planned experiences designed to assist individuals in developing the knowledge and skills essential to employment.

APPENDIX A: Listing of Occupations in Career Clusters

AGRICULTURE (including Agribusiness)

01.000000

01	Agricultural Production
0101	Animal Science
0102	Plant Science
0103	Farm Mechanics
0104	Farm Business Management
0199	Agricultural Production, Other
02	Agricultural Supplies/Services
0201	Agricultural Chemicals
0202	Feeds
0203	Seeds
0204	Fertilizers (Plant Food)
0299	Agricultural Supplies/Services, Other
03	Agricultural Mechanics
0301	Agricultural Power and Machinery
0302	Agricultural Structures and Conveniences
0303	Soil Management
0304	Water Management
0305	Agricultural Mechanics Skills
0399	Agricultural Mechanics, Other
04	Agricultural Products/Processing
0401	Food Products
0402	Non-food Products
0499	Agricultural Products, Other
05	Ornamental Horticulture (Production, Processing, Marketing, and Services)
0501	Arboriculture
0502	Floriculture
0503	Greenhouse Operation and Management
0504	Landscaping
0505	Nursery Operation and Management
0506	Turf Management
0599	Ornamental Horticulture, Other
99	Agriculture, Other

16.0000

02	Agricultural Related Technology
0201	Animal Science Technology
0202	Dairy Technology
0203	Food Processing Technology
0204	Plant Science Technology
0299	Agricultural Related Technology, Other

BUSINESS AND OFFICE

14.000000

01	Accounting and Computing Occupations
0101	Accountants
0102	Bookkeepers
0103	Cashiers
0104	Machine Operators: Billing, Bookkeeping, and Computing
0105	Tellers
0199	Accounting and Computing Occupations, Other
02	Business Data Processing Systems Occupations
0201	Computer and Console Operators
0202	Peripheral Equipment Operators
02021	Key Punch and Coding Equipment Operators
0203	Programmers
0204	Systems Analysts
0299	Business Data Processing Systems Occupations, Other
03	Filing, Office Machines, and General Office Clerical Occupations
0301	Duplicating Machine Operators
0302	File Clerks
0303	General Office Clerks
0399	Filing, Office Machines, and General Office Clerical Occupations, Other
09	Typing and Related Occupations
0901	Clerk-Typists
0902	Typists
0999	Typing and Related Occupations, Other
99	Office Occupations, Other
04	Information Communication Occupations
0401	Communication Systems Clerks and Operators
0402	Correspondence Clerks
0403	Mail and Postal Clerks
0404	Mail Preparing and Mail Handling Machine Operators
0405	Messengers and Office Boys and Girls
0406	Receptionists and Information Clerks
0499	Information Communication Occupations, Other

05	Materials Support Occupations (Transporting, Storing, and Recording)
0501	Planning and Producting Clerks
0502	Quality Control Clerks
0503	Shipping and Receiving Clerks
0504	Stock and Inventory Clerks
0505	Traffic, Rate, and Transportation Clerks
0599	Material Support Occupations (Transporting, Storing, and Recording), Other
07	Stenographic, Secretarial, and Related Occupations
0701	Executive Secretary
0702	Secretaries
0703	Stenographers
0799	Stenorgraphic, Secretarial, and Related Occupations, Other
08	Supervisory and Administrative Management Occupations
0801	Administrative Assistants
0802	Budget Management Analysts
0803	Clerical and Office Supervisors
0804	Data-Methods and Systems Procedures Analysts
0805	Office Managers and Chief Clerks
0899	Supervisory and Administrative Management Occupations, Other

16.0000

0117	Scientific Data Processing
04	Office Related Technology
0401	Computer Programmer
0402	Systems Analyst Technology
0499	Office Related Technology, Other

3.

16.0000
0107 Electrical Technology

17.000
1502 Industrial Electronics

16.0000
0108 Electronic Technology

17.0000
15 Electronics Occupations
1503 Radio/Television
1599 Electronics Occupations, Other

17.0000
05 Blueprint Reading
07 Commercial Art Occupations
0799 Commercial Art Occupations, Other
09 Commercial Photography Occupations
0901 Photographic Laboratory and Dark Room Occupations
0999 Commercial Photography Occupations, Other
13 Drafting
1501 Communications
19 Graphic Arts Occupations
1901 Composition, Makeup and Typesetting
1902 Printing Press Occupations
1903 Lithography, Photography, and Platemaking
1904 Photoengraving
1905 Silk Screen Making and Printing
1906 Bookbinding
1999 Graphic Arts, Other

01.000000	
01.0306	Agricultural Construction and Maintenance
01.0307	Agricultural Electrification
16.0000	
0103	Architectural Technology (Building Construction)
0106	Civil Technology
010601	Roadway Technology
010602	Sanitation Technology
010603	Structural Technology
010699	Civil Technology, Other
0110	Environmental Control Technology
011001	Cooling
011002	Heating
011003	Refrigeration
011099	Environmental Control Technology, Other
0102	Agricultural Technology
010201	Agricultural Electrification Technology
010202	Agricultural Machinery and Equipment Technology
010203	Agricultural Structures and Conveniences
010299	Agricultural Technology, Other
17.0000	
01	Air Conditioning
0101	Cooling
0102	Heating
0103	Ventilating (Filtering and Humidification)
0199	Air Conditioning, Other
10	Construction and Maintenance Trades
1001	Carpentry
1002	Electricity
1003	Operation, Heavy Equipment
1004	Masonry
1005	Painting and Decorating
1006	Plastering
1007	Plumbing and Pipefitting
1008	Dry Wall Installation
1009	Glazing
1010	Roofing
1099	Construction and Maintenance Trades, Other
36	Woodworking Occupations
3699	Woodworking, Other

020202	Design or Performing Arts
020203	Fashion Design
020204	Printmaking
02.0203	Environmental Design
020301	Architectural Design
020302	Industrial and Product Design
020305	Urban Planning
02.0204	Crafts
020401	Metal Work and Jewelry
020402	Pottery and Ceramics
020499	Other Crafts, Wood, Leather, Enameled Metal, Glass
02.0207	Photography and Related Media
05.06	Dramatic Arts
06011	Acting
0604	Play Production
0605	Technical Theatre and Design
08.0405	Performing Arts
040501	Dance
040502	Drama
040503	Music
040599	Other Performing Arts, Musical Instrument Repairman

07.000000

01	Dental
0101	Dental Assisting
0102	Dental Hygiene (Associate Degree)
0103	Dental Laboratory Technology
0199	Dental, Other
02	Medical Laboratory Technology
0201	Cytology (Cytotechnology)
0202	Histology
0203	Medical Laboratory Assisting
0204	Hematology
0299	Medical Laboratory Technology, Other
03	Nursing
0301	Nursing (Associate Degree)
0302	Practical (Vocational) Nursing
0303	Nursing Assistant (Aide)
0304	Psychiatric Aide
0305	Surgical Technician (Operating Room Technician)
0306	Obstetrical Technician
0308	School Health Aide
0399	Nursing, Other
04	Rehabilitation
0401	Occupational Therapy
0402	Physical Therapy
0403	Prosthetics
0404	Orthotics
0499	Rehabilitation, Other
05	Radiologic
0501	Radiologic Technology (X-ray)
0502	Radiation Therapy
0503	Nuclear Medical Technology
0599	Radiologic, Other
06	Ophthalmic
0601	Ophthalmic Dispensing
0602	Orthoptics
0603	Optometrist Assistant
0699	Ophthalmic, Other

07	Environmental Health
0701	Environmental Health Assistant
0702	Radiological Health Technician
0703	Sanitarian Assistant
0799	Environmental Health, Other
08	Mental Health Technology
0801	Mental Health Technician
0802	Mental Retardation Aide
0899	Mental Health Technology, Other
09	Miscellaneous Health Occupations Education
0901	Electroencephalograph Technician
0902	Electrocardiograph Technician
0903	Inhalation Therapy
0904	Medical Assistant (Assistant in Physician's Office)
0905	Central Supply Technician
0906	Community Health Aide
0907	Medical Emergency Technician
0910	Orthopedic Assisting
0999	Health Occupations Education, Other
16.0000	Technical
03	Health Related Technology
0301	Dental Hygiene (Associate Degree)
0302	Electroencephalograph Technician
0303	Medical Laboratory Assisting
0304	Radiologic Technology (X-ray)
0305	Nursing (Associate Degree)
0399	Health Related Technology, Other
07.0307	Homemaker/Health Aide

HOME ECONOMICS (including Consumer and Homemaking Education)

09.0100	Homemaking: Preparation for Personal, Home and Family Living
0101	Comprehensive Homemaking or Home Economics
0102	Child Development
0103	Clothing and Textiles
0104	Consumer Education
0105	Family Health
0106	Family Relations
0107	Foods and Nutrition
0108	Home Management
0109	Housing and Home Furnishings
0199	Homemaking, Other
09.0200	Occupational Preparation in Home Economics
16.0500	Home Economics Related Technology
09.0201	Child Care and Guidance Services
16.0501	Child Care Center Assistant
16.0502	Children's Hospital Division Assistant
16.0503	Teacher Aide at the Primary Level
09.0202	Clothing Production, Management and Services
17.1600	Fabric Maintenance Services
1601	Drycleaning
1601	Laundering
1609	Fabric Maintenance and Other
3301	Dressmaking
3302	Tailoring
09.0203	Food Management, Production and Services
07.0908	Food Service Supervisors (Hospital)
16.0504	Food Service Supervisor (works directly under the supervision of dietitian)

16.0505	Interior Decorator Assistant
16.0506	Home Equipment Demonstrator
16.0599	Other Home Economic Related Technology
17.0701	Interior Decorating
17.3500	Upholstering
02.0302	Interior Design
04.1000	Home Furnishings
09.0205	Institutional, Home Management and Supporting Services
14.9900	Other

HOSPITALITY AND RECREATION

01.0000	
0602	Recreation
0705	Recreation
04.0000	
07	Food Services
11	Hotel and Lodging
18	Recreation and Tourism
09.0000	
0203	Food Management, Production, and Services
0205	Institutional and Home Management and Supporting Services (Partial: hotel and motel housekeeping)
16.0000	
0504	Food Service Supervisor
17.0000	
29	Quantity Food Occupations
2901	Baker
2902	Cook/Chef
2904	Waiter/Waitress

MANUFACTURING

17.000000

21	Instrument Maintenance and Repair
2101	Instruments (Other than Watches and Clocks)
23	Metalworking
2302	Machine Shop
2303	Machine Tool Operation
2304	Metal Trades, Combined
2307	Tool and Die Making
2308	Die Sinking
2309	Metal Patternmaking
2399	Metalworking, Other
2301	Foundry
24	Metallurgy
0201	Electrical Appliances
0202	Gas Appliances
14	Electrical Occupations
1401	Industrial Electrician
1403	Motor Repairman
1499	Electrical Occupations, Other
20	Industrial Atomic Energy
2001	Installation, Operation, and Maintenance of Reactors
2002	Radiography
2003	Industrial Uses of Radioisotopes
2099	Industrial Atomic Energy, Other
3201	Electric Power Generating Plants
3202	Pumping Plants
3299	Stationary Energy Sources Occupations, Other
3300	Textile Production and Fabrications
2306	Welding and Cutting
230601	Electric Welding
230603	Combination Welding
230604	Brazing and Soldering
230699	Welding and Cutting, Other
3601	Millwork and Cabinet Making

17.000000

2305	Sheet Metal
27	Plastics Occupations
30	Refrigeration
32	Stationary Energy Sources Occupations
99	Trade and Industrial Occupations, Other

16.000000

01	Engineering Related Technology
0101	Aeronautical Technology
0105	Chemical Technology
0109	Electromechanical Technology
0111	Industrial Technology
0112	Instrumentation Technology
0113	Mechanical Technology
011301	Energy Conversion
011303	Production
011399	Mechanical Technology, Other
0114	Metallurgical Technology
0115	Nuclear Technology
0116	Petroleum Technology
0199	Engineering Related Technology, Other

MARKETING AND DISTRIBUTION

04.000000

01	Advertising Services
02	Apparel and Accessories
03	Automotive
04	Finance and Credit
05	Floristry
06	Food Distribution
08	General Merchandise
09	Hardware, Building Materials, Farm and Garden Supplies and Equipment
10	Home Furnishings
12	Industrial Marketing
13	Insurance
14	International Trade
16	Petroleum
17	Real Estate
19	Transportation
20	Retail Trades, Other
31	Wholesale Trade, Other
99	Distributive Education, Other

17.0000

0702	Window Display

NATURAL RESOURCES AND ENVIRONMENT

01.000000	
07	Forestry (Production, Production, Processing, Management, Marketing, and Services)
0701	Forests
0702	Forest Protection
0703	Logging (Harvesting and Transporting)
0704	Wood Utilization
0706	Special Products
0799	Forestry, Other
16.0000	
0603	Forestry Technology
01.000000	
06	Agricultural Resources (Conservation, Utilization, and Services)
0601	Forests
0603	Soil
0604	Wildlife (Including Game Farms and Hunting Areas)
0605	Water
0606	Air
0607	Fish (Including Farms and Hatcheries)
0608	Range
0699	Agricultural Resources, Other
	Environmental Health
10.	
16.0000	
0604	Oceanographic Technology (Physical, Biological, and and Fisheries)
17.0000	
08	Commercial Fishery Occupations
0801	Maritime Occupations
0899	Commercial Fishery Occupations

PERSONAL SERVICES

17.2600	Personal Services
17.260	Barbering
17.2602	Cosmetology
17.2699	Other Personal Services
07.0909	Mortuary Science

Personal Service Areas with No Codes

Physical Culture
Household Pet Services

PRODUCT SERVICES (Mechanics and Repairers)

01.0305	Agricultural Mechanics Skills
10.1800	Service Industries Repairs
17.0200	Appliance Repair
0201	Electrical Appliances
0202	Gas Appliances
17.0600	Business Machine Maintenance
17.1503	Radio/Television Repairs
17.2102	Watchmaking and Repair
17.3100	Small Engine Repair
17.3402	Shoe Repair
09.0204	Home Furnishings, Equipment and their services

PUBLIC SERVICE AND PROTECTIVE SERVICE

14.0000	
06	Personnel, Training, and Related Occupations
0601	Educational Assistants and Training Specialists
0602	Interviewers and Test Technicians
0603	Personnel Assistants
0699	Personnel, Training, and Related Occupations, Other
16.0000	
0501	Child Care Center Assistant
0503	Teacher Assistant
17.0000	
28	Public Service Occupations
2899	Public Service Occupations, Other
3200	Stationary Energy Service Occupations
3201	Electric Power Generating Plants
3203	Pumping Plants
3299	Stationary Energy Source Occupations, Other

16.0000	
0602	Fire and Fire Safety Technology
0605	Police (Law Enforcement and Corrections) Science
17.0000	
1100	Institutional Custodial Services
2801	Fireman Training
2802	Law Enforcement Training

13.

16.0000

0104	Automotive Technology
0601	Commercial Pilot Training

17.0000

03	Automotive Services
0301	Body and Fender
0302	Mechanics
0303	Specialization, Other
0399	Automotive Services, Other
04	Aviation Occupations
0401	Aircraft Maintenance
040101	Airframe
040102	Power Plant
040199	Aircraft Maintenance, Other
0402	Aircraft Operations
0403	Ground Operations
0499	Aviation Occupations, Other
12	Diesel Mechanic
22	Maritime Occupations
0802	Ship and Boat Operation and Maintenance