

AN ABSTRACT OF THE THESIS OF

CRAYTON BROOKS DALY for the DOCTOR OF EDUCATION
(Name) (Degree)

in EDUCATION presented on June 2, 1972
(Major) (Date)

Title: PROJECTION MODEL ASSESSING THE NEED FOR INSTRUC-
TORS OF OCCUPATIONAL SUBJECTS IN OREGON'S
COMMUNITY COLLEGES,

Abstract approved: *Redacted for Privacy*
Dr. Henry A. Ten Pas

The major thrust of this research was to design, test, and perfect an accurate and effective assessment technique, which would result in becoming an assessment model. For the purpose of developing this assessment model, the employment need for full-time instructors of occupational subjects in the community colleges within the state of Oregon was assessed. This assessment model was so designed that, in the process of development, it would determine the degree of relationship between the full-time occupational instructor needs for the 1971-72 and 1976-77 school years, and to show the relative growth of Oregon's occupational education programs during the next five years as predicted from the demand for full-time occupational education instructors.

Successful completion of the assessment model would answer three questions: (1) What were the number of new full-time position

needs on June 1, 1971, the ending of the 1970 school year? (2) What were the number of new full-time position needs on March 20, 1972, the date of the assessment? (3) What new full-time position needs were estimated for the school year 1976-77?

To provide direction for answering the three indicated questions, two null hypotheses were formulated to test the findings: (1) There is no significant relationship between the needs for the 1971-72 year and the 1976-77 occupational instructor estimates. (2) There is no significant difference in mean estimate between 1971-72 and 1976-77 occupational instructor needs.

Thirteen individuals who had the area of responsibility for the individual college-wide administration of the program of occupational education were selected for completing the assessment. These college administrators, by assisting with the development of this model, tended to develop a more positive attitude toward the necessity of making a more accurate and effective assessment. This is attributed to the personal contact and interview technique which utilized a survey questionnaire and a common interview guide.

Analyses of data revealed a significant relationship at the .01 percent level between the 1971-72 occupational instructor employment needs and the 1976-77 estimates. A significant difference at the .01 percent level was found between the two mean instructor estimates for the 1971-72 and 1976-77 school years. Since the mean estimate for

the 1976-77 school year was larger than the mean estimate for 1971-72, it was proposed that, on the average, Oregon's community college occupational education programs can expect to experience a significant growth of about 34 percent as indicated by their demand for occupational instructors.

Analyses of data revealed that the technical programs cluster will have the most instructor need growth. The clusters, service occupations, forestry, and home economics will also have considerable instructor need growth, while agriculture, marketing/management, health occupations, and marine technology are indicated as those that will have the most significant comparative rank loss instructor need during the next five years.

Projection Model Assessing the Need for Instructors
of Occupational Subjects in Oregon's
Community Colleges

by

Crayton Brooks Daly

A THESIS

submitted to

Oregon State University

in partial fulfillment of
the requirements for the
degree of

Doctor of Education

June 1973

APPROVED:

Redacted for Privacy

Professor of Education
in charge of major

Redacted for Privacy

Dean of School of Education

Redacted for Privacy

Dean of Graduate School

Date thesis is presented June 2, 1972

Typed by Mary Jo Stratton for Crayton Brooks Daly

ACKNOWLEDGEMENTS

The number of persons who have directly helped in perfecting this assessment model through interview and counsel is too large to be acknowledged individually; but without them giving time from their busy schedules, the model could never have been completed. Especially cooperative were the directors of Oregon's community college occupational programs. Their quick understanding of the intent and purpose of this model and their unvarying courtesy and cooperation will always be remembered. Further heartfelt thanks are extended to:

My wife, Edna, and son, Mike, for their continuous understanding and encouragement.

Dr. Henry A. Ten Pas for sharing with me his wisdom and for giving me support and assistance which will have an everlasting effect.

The doctoral committee for their assistance and their efforts to personalize our association.

The late Dr. May DuBois for never ending inspiration and who reminded me that man is born to prove himself worthy of creation; not to radiate in brilliance, not to dream of intoxication, but to be worthy and be dignified.

TABLE OF CONTENTS

	<u>Page</u>
I. INTRODUCTION	1
Purposes of the Study	2
Statement of the Problem	4
Basic Assumptions	8
Hypotheses	9
Scope and Delimitations of the Study	9
Definition of Terms	10
II. REVIEW OF RELATED LITERATURE	14
Instructor Supply and Demand	15
National Needs	15
State of Oregon Needs	24
Direct Related Studies	26
III. PROCEDURAL DESIGN OF THE STUDY	30
Data Collection	30
Population	32
Respondent Contacts	33
Treatment of Data	34
Detailed Description of Model	35
IV. FINDINGS	40
Tabulation	40
Analysis	45
V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS	51
Summary	51
Conclusions	53
Recommendations	55
BIBLIOGRAPHY	57
APPENDICES	63
Appendix A	63
Appendix B	77

	<u>Page</u>
Appendix C	89
Appendix D	93
Appendix E	98
Appendix F	101

LIST OF TABLES

<u>Table</u>		<u>Page</u>
1	Occupational instructor needs in those occupational programs that reported more than one employment need for the 1971-72 school year, by comparative rank.	40
2	Percentages of increase/decrease in the employment need of full-time instructors of occupational subjects in Oregon's community colleges, 1970-71 school year.	42
3	Occupational instructor needs in those occupational programs that reported more than three employment needs for the 1976-77 school year, by comparative rank.	43
4	Present and estimated instructor needs for the clustered grouping of occupational programs offered in Oregon's community colleges, 1971-72 and 1976-77 school years.	44
5	Occupational education program clusters that had comparative rank gains in relation to occupational instructor need estimates for the 1971-72 and 1976-77 school years.	46
6	Occupational education programs that had comparative rank losses in relation to occupational instructor need estimates for the 1971-72 and 1976-77 school years.	46

PROJECTION MODEL ASSESSING THE NEED FOR INSTRUCTORS
OF OCCUPATIONAL SUBJECTS IN OREGON'S
COMMUNITY COLLEGES

CHAPTER I

INTRODUCTION

This is a critical time with respect to the staffing of our institutions. We are in a period of unprecedented expansion. It is likely that in the next five years junior college enrollments will double and reach about three million and that as many as 75,000 additional faculty members will be needed. The rapid development in technical and semi-professional programs to prepare men and women for employment suggests that the needs for instructors in these fields will sharply increase (28, p. 7).

Dr. Edmund J. Gleazer, Jr., Executive Director of the American Association of Junior Colleges, wrote the above statement in a recent editorial of the Junior College Journal published by the American Association of Junior Colleges. Gleazer's statement is but one of the many indicators that there is an urgent, growing need for more exact data concerning the demand for instructors of occupational subjects in national as well as Oregon's community colleges. Oregon State University, as well as other teacher training institutions in the state of Oregon, has long needed some empirical basis for the program development in occupational, technical teacher education. Administrators, counselors, and instructors constantly search for factual information and techniques to utilize the data that will aid them

in the effective planning and counseling of associate degree students who may desire to obtain the bachelor of arts degree in occupational technical education. The crucial need to develop techniques for faculty development is implicit to the tremendous increase of student enrollment in the community colleges of the state of Oregon.

Purposes of the Study

The purposes of this study are:

1. To design, test, and perfect an accurate and effective instrument to assess and project the need for full-time instructors in occupational education.
2. To demonstrate and present the importance of using, for effective planning, a structured assessment model to determine the need for full-time instructors of occupational subjects using the total number of community colleges within the state of Oregon as an assessment example.
3. To indicate and present the necessity for effective staff planning, the degree of relationship between the full-time occupational instructor needs for the present and projected estimates, using the 1971-72 and 1976-77 school years in Oregon's community college occupational education programs.
4. To present an instructor need assessment model which can be used to show relative growth of occupational education programs

for a projected period of five years, as predicted from the demand for full-time occupational education instructors, using Oregon's community college occupational programs as the population.

It is expected that these determinates and assessments will provide the recognition of the need to assess and a model of a method with which to make the assessment. It is further expected that this assessment model presentation will provide a significant contribution toward more effective and efficient programs of preparation for instructors of occupational subjects to face the unique challenges in the years ahead. It is further expected that community college vocational directors will be more aware and capable of considering strategies for resolving critical occupational education personnel supply-and-demand problems.

Focusing on the following four questions will permit this study to accomplish its purposes:

1. To what degree do the occupational directors share an awareness for the need to assess the present and projected need for full-time instructors of occupational subjects in order to facilitate more effective planning?

2. What was the number of new full-time instructor position needs on June 1, 1971 (ending of 1970-71 school year)?

3. What was the number of new full-time instructor position needs on March 20, 1972, the date of assessment?

4. What new full-time position needs are estimated for the 1976-77 school year?

Statement of the Problem

The community college is a needed response to the American aspiration that education--and as much of it as is individually desired--shall be available to all persons. Not long ago, high school was often the final formal educational experience for most people; during that period, for most people graduation from high school was often adequate. Our complex society today makes the demand for continued education, and the community college, publicly supported, does offer an opportunity to meet the demanding educational need of today.

Review of the literature reveals that the historical development and the rapid growth of the community college movement indicates that effective college administrators must realize the necessity for planning. For the college administrators, planning means important determinations made in advance, which includes the need to know the supply and demand for instructional staff. Review of the literature indicates that little or nothing has been done to determine the need for present and projected instructional staff; even though evidence indicates that the community college student enrollments are and have been experiencing exceptional growth resulting in the need of planning for the instructional staff.

The community college is not a new educational level in the American structure of formal education. The historical development of the community college began in the year of 1835. The junior college concept, established by William R. Harper, consisted of lower division curricula and began at the University of Chicago in 1892. This is considered by many persons as the true beginning of the two-year community college development (20, p. 47).

Harper's college was established as a compromise between the American four-year college and the German educational tradition. It was founded upon the principle that a large number of persons in the community needed education that the taxpayers could not provide through four-year colleges. Many of the earlier two-year institutions were privately established by particular religious denominations to emphasize the tenet of their faith. The public two-year institutions; with which this study is concerned, were founded on the premise of an egalitarian society in which every member should be allowed to develop to the limits of his ability.

These colleges were, in fact, extensions of a secondary education, many times using high school curricula, staff, and buildings. By 1925 there were already over 400 junior colleges in America offering terminal vocational programs. That year the American Association of Junior Colleges, according to Thornton, wrote that:

A different type of curriculum suited to the larger and ever-changing civic, social, religious, and vocational needs of

the entire community in which the college is located. It is understood that in this case also the work offered shall be on a level appropriate for high school graduates (66, p. 51).

It seems possible that Thornton was giving recognition to the long-accepted fact that people have given respect to the need for continuing education. Many graduates of collegiate institutions desire a certificate as evidence of their achievement. It is for this reason that today all community colleges in the state of Oregon confer a certificate, a degree, or title, usually called an associate degree.

Evidence that the demand for continued education and the associate degree is increasing is presented by Gleazer (29), who has indicated that in the state of Oregon, during 1959, a total of 264 associate degrees were conferred. The increase is noted by Hooper (38), who indicated that in 1969, only ten years later, 1,545 associate degrees were conferred in the state of Oregon. Gleazer further stated that in 1959, Oregon had a total of three community colleges, two publicly controlled and one privately controlled, with a total enrollment of 2,413 full-time students. In the 1969 publication of the Directory of the American Association of Junior Colleges (30, p. 75), 11,251 full-time students are summarized as being in attendance in Oregon's 12 public community colleges. An example of enrollment growth is dramatically made evident by the Oregon Education 1971 Biennial Report (54, p. 3), which does indicate that in 1970 a total of 23,500 full-time students were enrolled in Oregon's community

colleges and that the enrollments are nearly three years ahead of the previous predictions. The fact that enrollments continue to jump indicates that public demand for community college post-high school education programs is continuing on a high level, and that the saturation point has not been reached. The editorial entitled Emphasis, 1971 Fall Enrollment (19, p. 3) indicates that with 35 states reporting their community college enrollments, an increase in national enrollment is indicated at 13.7 percent, with suggestions that total enrollment for that year shall reach more than 2.75 million. The state of Oregon has already an indicated enrollment increase of 37.5 percent.

The Carnegie Commission on the Future of Higher Education, Third Report (7, p. 43), indicates that nearly 200,000 new teachers will be needed in community colleges by 1980. Oregon's 12 community colleges employed 2,113 instructional personnel during the fall term of 1969. Since then another community college has come into existence and with it 68 more instructors to be added to the already given total. Presently the state of Oregon is divided into 13 community college districts and although no additional districts may be added, satellites to the existing community colleges may and already have been added in order to compensate for the demand of continuing education. That there is a need to determine the present and projected demand for instructors of occupational education in Oregon's community colleges is beyond refutation in view of the overwhelming evidence of need and indications of community college growth. Occupational directors who hire instructors know that there are some fields which are in much shorter supply than others. They do not have the method of

assessment and interpreting the data of instructor supply and demand information and must have it for adequate planning. It is the purpose and intent of this assessment model that, when completed, it will offer an illustration of an effective assessment procedure.

Basic Assumptions

To develop this study, six basic assumptions were made:

1. The vocational directors of the community colleges have no effective and accurate method of assessing instructor need. An assessment model would facilitate their need for making accurate assessments.
2. The vocational directors of the community colleges are the most accurate source of information concerning the needs for occupational instructors within their institutions.
3. In this study, the vocational directors are considered to be a valid source for obtaining the data for occupational instructor needs.
4. There has been efficient program coordination in the state of Oregon to avoid duplication in meeting the educational needs of occupational students within the state.
5. The estimation of new instructor position needs might be influenced by human factors, such as conservative or over-optimistic considerations about the future growth of certain programs.
6. Within the period indicated in this study, college offerings

and enrollment distribution, including distribution by terminal and transfer or associate degree programs, will not change enough to appreciably affect the projections.

Hypotheses

These hypotheses provide the direction for collecting discriminately the collection and analysis of the data for the purpose of developing this proposed instructor need assessment model. The null hypotheses are:

1. There is no significant relationship between the needs for the 1971-72 school year and the 1976-77 occupational instructor need estimates for Oregon's community college occupational education programs.
2. There is no significant difference in mean estimates between 1971-72 and 1976-77 occupational instructor need estimates in Oregon's community college occupational education programs.

Scope and Delimitations of the Study

The following scope and limitations were included in this study:

1. This study was designed for the development of a model which would assess the occupational instructor employment need and used the questionnaire and interview technique to increase the validity of the collected data.

2. The population of this study was limited to the public community colleges in the state of Oregon.
3. This study was limited to persons who were classified as being employed in the community colleges as directors of occupational education and who had the responsibility for the college-wide administration of the program of occupational education.
4. This study was limited to persons who were rated as full-time instructors of occupational subjects.
5. The interview alone is not always an effective appraisal device. The interviews for this study were conducted by carefully selecting a questioning procedure that resulted in a common interview guide (Appendix A). The use of this guide resulted in the standardization of the required elicited responses necessary for the completion of the assessment questionnaire.

Definition of Terms

The following definitions were included for the purpose of standardizing the use of terms in the study. Other terms or phrases used in the study were either defined in the "Standard Terminology for Curriculum and Instruction in Local and State Schools," State Educational Records and Reports Series, Handbook VI (56), or were considered to be self-explanatory.

Community college is an educational two-year public institution, publicly controlled and operated under state law; not granting baccalaureate degrees, but offering occupational, general education programs, and academic education equivalent to two years of work in standard college curricula. The community college curricula is designed to provide a wide range of options and services in response to the needs of the local community. For purposes of this study, no distinction is made between the junior college and the community college.

Associate degrees are nationally recognized and are conferred upon those who complete the general requirements of the lower division collegiate program. The general requirements for the associate degree programs in Oregon community colleges include:

Provisions for satisfactory completion of not less than two school years of post-high school work. Such a program shall provide for a prescribed series of related courses of not less than 90 term units. (Where terminal curricula are concerned term units are defined basically in the same manner as for other recognized post-high school institutions.) (51, p. 10)

Associate degree curricula give the student the advantage of completing a recognized unit of academic work. He is not merely taking courses prerequisite to advanced level offerings which he will never experience if he terminates his college work at the end of two years. Emphasis is upon occupational preparation, but community colleges usually accept the responsibility for intellectual breadth and personal enrichment as well as occupational proficiency.

Occupational director is the person who has the area of responsibility for the college-wide administration of the program of occupational education, consisting of professional leadership and management activities related to instruction which is school-wide in scope; typically includes such persons as occupational deans, associate deans, assistant deans, vocational directors, and, occasionally, division chairmen.

Instructors are the personnel who, as staff members, render full-time direct and personal services which are in the nature of teaching or the improvement of the teaching-learning situation.

Staff members are those instructors whose relationship with the community college meet all of the following criteria: (1) the instructor has total current assignments that require his services full-time; (2) the instructor serves under the rules and regulations of the governing authority of the college system; (3) the instructor is assigned to perform activities which provide a teaching service for the college; (4) the instructor is in an employee relationship with the college recognized by law for such purposes as Workmen's Compensation coverage, Federal Insurance Contributions Act (FICA), and withholdings from salary for income tax.

Occupational education, as used in this study, is intended to encompass such terms as professional, semiprofessional, technical, and skilled-level curricula for all fields of employment. It refers to

any and all education and training offered by community colleges aimed at preparation for employment, as distinguished from curricula in the liberal arts, the fine arts, or the humanities.

Technical education, as used in this study, is organized into two-year curricula at the college level; emphasizes work in the fields of science and mathematics, and frequently, but not always, is related to industry and engineering; gives much attention to technical knowledge and general education, but also stresses practice and skill in the use of tools and instruments; leads to competence in one of the technical occupations, and usually to the granting of an associate degree (35, p. 43).

CHAPTER II

REVIEW OF RELATED LITERATURE

The major purpose of this study was to perfect and to offer a more accurate, effective method by which to assess and project the needs for full-time instructors in occupational education. Occupational education programs of Oregon's public community colleges were used in the presentation of this instructor need assessment model. The review of literature was directed toward answering the following questions:

1. Is there written evidence that the supply and demand assessment of occupational instructors is needed?
2. Have related or similar equivalent studies been previously done using a structured assessment model or other similar methods?
3. Are there limitations of equivalent or related studies that can be analyzed so as to improve the present study?

This chapter reviews the literature relevant to staffing problems--past, present, and projected--of instructors in community colleges on a national, as well as a state, level. Comprehensive review of supply and demand with added implications for planning consideration has been included.

The writings summarized and the excerpts included were

selected for their value in clarifying understanding of the original research and proposals for the present study.

Instructor Supply and Demand

National Needs

Community college administrators today face many problems; enrollments are unprecedented, new programs are being introduced, and our technological and economic society is requiring retraining programs often unique to any institution. The crucial factor for meeting these challenges is those persons whose role requires policy and decision-making concerning the employment of occupational education instructors. The need is evident that these administrators need to know the immediate supply and demand of occupational instructors.

The lack of information pertaining to the supply and demand for instructors of occupational subjects is described by Davies (15).

He says:

Projections for 1975's supply of vocational teachers are frustrating because of the lack of data on teachers other than accredited secondary ones (15, p. 93).

Davies emphasized that in order to gather the much needed data, administrators must plan ahead. This planning, in order to be successful, must consist of systematically collecting information on the teacher supply and demand. Davies further indicated that persons on

the state level must take this responsibility, especially on supply and demand, and that what little information there is on the national level pertaining to this issue is of little value for state planning. It should be recognized that it is of little value to the state or local planners because of the wide variation in educational needs. Federal funds totaling over 10 percent of the total federal vocational funding for permanent vocational educational programs have been made available to states to enable them to plan ahead by gathering the needed planning information. This type of federal assistance is given with the belief that the states will be capable of assessing their own needs more accurately.

Davies (14) points out that many of the recent publications, which indicate that the teacher shortage is over, are in themselves totally incorrect. Contributing to the belief that there is no longer a teacher shortage is the fact that traditionally 30 percent of the persons trained to teach never did so, except when there were no other employment opportunities available. Our present economy is today forcing more teacher-trained persons to accept teaching positions, which has really resulted in reducing the teacher shortage. Accepting this manner of computation in its entirety would tend to cloud the fact that there is a shortage of instructors in occupational education, simply because occupational instructors have not been trained in proportion to the non-technical teachers. Davies alludes to the fact that the teacher

shortage does exist and that the problem of staffing the schools with occupational instructors will continue unless careful consideration is given to recent supply and demand statistics. More specific information on the supply and demand situation is desperately needed, and an intensified effort should be made to supply each school administrator with that information from the state level.

President Nixon, in his 1970 Higher Education Message, which he sent to the Congress on March 19, 1970, indicated that a person who graduates from high school today and does not have an opportunity to attend a community college is at a distinct disadvantage. Nixon states that:

There is much to be proud of in our system of higher education. Twenty-five years ago, two Americans in ten of college age went to college; today, nearly five out of ten go on to college; by 1976, we expect seven out of ten to further their education beyond secondary school (49, p. 28).

Review of the foregoing quotation results in more positive evidence of the projected enrollment growth of our community colleges. Nixon (49, p. 30) states that he does use the term "college" to define all post-secondary education--including vocational schools, four-year colleges, and junior and community colleges. The need for post-secondary education, of which President Nixon is obviously cognizant, is expressed equally well by Whaley, who says that:

There is about 100 times as much to know now as was available in 1900. By the year 2000, there will be over a thousand times as much knowledge of all kinds to record, to sift, to

store, to search out, to teach about, and, hopefully, to use with some discrimination and effectiveness (61, p. 107).

Acknowledgment of the indicated projected knowledge explosion brings with it an understanding that more accurate and effective instructor assessment techniques will have to be developed so that an adequate supply of trained occupational instructors is available.

Johnson (39) indicates that in the next 30-35 years more changes in the way man lives and works will occur than ever before in history. He further indicates that in 300 years--1600 to 1900--technological and scientific advances caused more changes in the way man lives and works than in the 6,000 years preceding. It is indeed fortunate that we, today, have so many great leaders who are capable of foreseeing the need for education and knowledge. Johnson emphasized that what the railroad did for the last of the 19th century and the automobile did for the first half of the 20th century, education must do for the last half of the 20th century. In facing the pressures of vastly increased enrollments and funding problems and with an increasing demand from the public to attain the highest level of achievement and efficiency, the community colleges have a particular responsibility for realistically planning; this planning includes identification and knowledge of the supply and demand for occupational instructors.

Russo (59) describes equally well the social, technological, and economic forces that are reshaping our society today, and he makes

claim to the fact that education is the key to success for accepting these changes. Mention is made of the Vocational Education Amendments of 1968 and how they affect education by authorizing new programs for the changing of our society. Recognition is given that the labor market has been complicated by industry relocations and internal shifts and that, in addition, the number of positions requiring untrained minds and physical strength has declined, while jobs requiring advanced education and perfected skills have increased. Russo offers for consideration the following statistics, which further indicate the need for community college administrators to know the supply and demand of occupations instructors. Russo writes that:

Since the passage of the 1963 vocational education legislation, there has been a steady increase in vocational education enrollments, from 349,000 in 1964 to an estimated 8.1 million in 1967. Projections indicate an enrollment of 14 million by 1968. The recruitment, training, and retention of qualified administrative and teaching staff are among the most critical needs in vocational education, as they are throughout the education establishment. It is estimated that some 2,000 additional supervisors, administrators, specialists, and teacher trainers will be required in vocational education at the state level by 1975. By the same date, about 2,500 similar staff members will be needed at the local level, a total increase of more than 4,500. The number of vocational teachers needed will have more than doubled between 1966 and 1975, from 123,042 to a projected 257,900 (59, p. 10).

New materials, new processes, automation, and improved techniques of measurement and control have combined to increase the need for technically competent persons with special abilities who can support and supplement the efforts of engineers and scientists

throughout the technological complex. The need for technically competent persons can only be met by expanded educational services. That the community college movement is expanding cannot be denied. Of all post-high school educational institutions, it would be safe to say that the rate of increase in the number of institutions and in enrollments will be most rapid at the community college level. Recent developments in this direction promise to continue at our accelerating rate. Gleazer (30), the man who has for over 12 years been more closely and actively associated with the growing community college movement than any other person, makes known that nothing in education in the past half century can surpass the recent expansion of the community college concept. For the past eight years, he says, a new community college has been opened each week, and that the rate of enrollment increase is about 15 percent a year. That an average of one-third of all students entering a higher education program begin their initial program in a community college is acknowledged by Gleazer, who also indicates that about one-third of all students enrolled in community colleges opt for the semiprofessional and technical education programs. It is here that the occupational programs increase in numbers. Gleazer helps one to understand the enormity of the community college growth pattern by relating that on the first day Seattle Community College was opened, 12,000 students were attracted. Gleazer asks:

Where do you find the necessary teachers? How do you prepare them for what most experts consider the "special" needs of junior college teaching? Estimates of the number of trained teachers needed during the next decade run into tens of thousands (30, p. 13).

Maul (44) asks, "Will a sufficient supply of teachers be available?" His question is no different from that asked by a great many education leaders today. He indicates that this question is the most perplexing problem and that new colleges can be built at will, but that an occupational education instructor is an independent person, subject to the competing labor market, and that even graduating a certain number of persons at various degree levels does not assure an available supply of persons for teaching positions. Maul states that:

As the colleges and universities concentrate more and more on upper-level and graduate offerings, they will be thrusting an enlarged responsibility for vocational and terminal education upon the junior college. But, at the same time, they will also be leaving to the junior colleges a greatly expanded responsibility for the first two years of general programs in the arts and sciences, teacher education, and sound undergraduate preparation for graduate study in many fields. And this dual role, of course, gives rise to the necessity for greater diversity in teaching staff (44, p. 5).

Nationwide, according to Conner, data analyst of the 1971

Junior College Directory, there is:

An increase of 53 community colleges over the previous year. Twenty-nine new institutions began classes in 1970, now indicating a total of 1,091 American institutions. The recent newly opened 29 institutions alone enrolled a total of 27,721 students, eight of the new colleges had opening enrollments of more than 1,000. Overall total enrollment in colleges listed in the 1971 directory increased from 2,238,504 in 1969 to a total of 2,499,837 in October, 1970. This is an

increase of 260,333 students, or a growth of 11.7 percent in total enrollment (31, p. 6).

In the state of California, with a total of 97 colleges and an enrollment of 717,130 students during the year of 1970 (31, p. 9), a study was completed by Holy (37) for purposes of determining how many new full-time equivalent staff members were estimated to be needed by 1970 in selected subject fields and in total by the junior colleges, state colleges, University of California, private colleges, and universities in the state. There were four other purposes for the study, and only one other seemed to have relationship to the present study--it being the purpose of learning in which fields were there an oversupply, balance, or undersupply anticipated. Observations and conclusions of this study in relation to the balance of supply and demand is most interesting because the state of Oregon borders the state of California. It was determined that the proportion of demand for faculty in California institutions which has been supplied from out of state will continue, as in the past three years, at about half of the total demand. It was indicated that an overall balance did not apply to certain subject areas in which there were present shortages or in which future shortages may develop--these subjects areas were not mentioned.

Berelson (2, p. 68-69) reported that junior colleges in 1960 employed about 10 percent of the total higher education teaching staff

and predicted a greater percentage by 1970. He observed that 10 percent of this faculty held doctorates and believed the percentage would grow. In his opinion (2, p. 224), the crisis over the potential supply of college and university teachers in 1970 is generally overstated. The response received by McGrath (45, p. 17, 23) from 503 higher education administrators in 1961 indicated that 86 percent of them believed it would become increasingly difficult to secure college teachers.

Over 20 years ago, a growing demand for two-year institution personnel was forecast. A report (11, p. 3) published in 1949 under the title, "Wanted: 30,000 Instructors for Community Colleges," outlined preparation requirements for such personnel and emphasized that 30,000 such teachers would be needed each decade of the foreseeable future.

A statewide conference (55, p. 41) of California junior college administrators in 1958 acknowledged a shortage of qualified teachers that would become more acute in the future. A 1960 statewide study (33, p. 131, 136) of higher education in California projects a need between 1959 and 1975 of 14,711 new junior college teachers and suggests major efforts that senior institutions should make to meet this need. A significant contribution toward aiding the need for junior college instructors is an accurate and effective assessment model which will not only collect more accurate data but will cause a

favorable effect on the attitude of those administrators who need to assess.

Eckert and Stecklin (18, p. 83-89) document reasons why there is need to publicize the purposes and programs of junior colleges and to recruit able young people to the faculties. Brunner and Lindquist (4, p. 327-339) cite reasons why junior college administrators should work toward improving faculty environment and utilize more varied recruitment methods. Eurich (21, p. 8-12) forecasts that the community college will, during the second half of the 20th century, extend education for everyone, and makes suggestions to meet the growing faculty need.

State of Oregon Needs

The crucial role of the teaching faculty is implicit in all that has been said about the nature and mission of the community college. It would appear that unless qualified instructors are available in sufficient numbers, the purposes of the college cannot be achieved. The need to know the supply and demand for instructors is self-evident, and here in the state of Oregon, the swelling enrollment of the state's community colleges is indicated by statistics found in the Oregon Board of Education Biennial Report (54, p. 122). It indicates that the total community college enrollment of 171,450 during the 1971 biennium represented an increase of nearly 48 percent over the

previous biennium, when 116,005 students were enrolled. Further statistics (52, p. 1) indicate a 49 percent increase in the number of full-time equivalent students in Oregon's community colleges--from 15,778 in 1967 to 23,492 in 1969-70. Proper inference may be made that since the full-time equivalent enrollment is an indicator of total student class or clock hours of effort, the major learning effort was being increasingly expanded toward completion of associate degree programs in occupational education. Gleazer (31, p. 66-67) indicates that during the 1969-70 biennium, there were 1,208 full-time occupational instructors employed in Oregon's 13 community colleges. An accurate total of part-time instructors was not indicated. Necessity for learning that information was not important because the assessment model development attempt in this study will only be concerned with the full-time occupational instructors.

All community colleges in Oregon award the associate of science degree, and all but one award the associate of arts degree. The number of associate degrees in occupational education awarded will undoubtedly increase in the state of Oregon because of the untiring effort and crystal-clear vision of Atteberry (1), who has helped make it possible for persons who wish to become technical educators to receive their first two-year teacher education program at the community college in the state of Oregon. Upon the completion of the associate of science degree, the person may transfer a block of

credits directly to a four-year degree program with no loss of credits. Atteberry indicates that over 70 percent of the students in unnamed six largest states preparing to become industrial education teachers were transfers from community colleges, which further offers more indication that the community colleges are increasingly offering the first two educational years of a four-year program.

Most recent indication of Oregon's community college continuing enrollment is found in The Inside Story (53, p. 2). Here it is indicated that enrollment in Oregon's 13 community colleges in the fall of 1971 climbed to 61,978, an 11.6 percent increase over the record amount in 1970. Figures for the schools are Blue Mountain, 1,554; Central Oregon, 1,006; Chemeketa, 4,407; Clackamas, 3,548; Clatsop, 1,958; Lane, 8,755; Linn-Benton, 3,531; Mt. Hood, 9,602; Portland, 21,388; Rogue, 1,047; Southwestern, 2,198; Treasure Valley, 972; and Umpqua, 2,012. The total indicated enrollment did not separate the occupational education students from the general academic students.

Direct Related Studies

No study was found at the state level which was related to this present study. Two national studies were found to be related. In order to consider the second listed reason for review of literature, three important limitations were found in the related studies. An attempt was made to minimize their effect in the present study:

1. The administrators have had difficulties in predicting enrollments with reasonable accuracy when the enrollments are fluctuating rapidly (57, p. 2).
2. The use of small samples from the total population has caused significant sampling errors (64, p. 43).
3. The tendency of administrators to be conservative or over-optimistic in their teacher estimates has not been properly controlled (64, p. 43).

The related study which was done by Rogers (57, p. 118-122), who did survey the demand for faculty and other professional staff in the nation for a period that included from November, 1963, through October, 1969, did estimate that a total of 5,464 replacements and additions were going to be needed in all two-year institutions, which included junior colleges, technical schools, and semiprofessional schools. This total included all staff members engaged in teaching, research, administration, and services. From the previous total, 2,429 replacements and additions were going to be needed in engineering-related fields and 3,025 in non-engineering fields (57, p. 118-122). This study was found to have limited application in program development for occupational instructor education, especially at the state level and in specific areas or technologies.

The other national study which had some similarities to the present study originated at Purdue University and was done by the

Industrial Education Division. Suess, an Associate Professor of Industrial Education at Purdue University, stated that:

Accurate information concerning the demand for teachers of technical subjects is extremely difficult to obtain. Educated guesses, telephoned pleas for help in locating staff, and similar sources indicate more positions than qualified personnel. Lacking is a recent assessment of present and projected needs for technical teachers that is categorized by technical specialty (64, p. 39).

A need for 887 teachers of technical subjects for the 1968-69 school year and 1,584 additional vacancies for the 1973-74 school year were identified in the Purdue study (64, p. 39).

In summary, the basic methodological approach and reasons for attempting this present study is hinged upon the urgent need for this type of information. Considerable evidence has been presented nationally and on the state level which indicates the necessity for this study and the introduction of a workable assessment model. To the question, "Why is knowledge pertaining to supply and demand of occupational instructors so important?", the answer would be that resources available for the provision of all public services are limited. Education is in competition with all other public services; therefore, comprehensive planning, which includes knowing the supply and demand of occupational instructors, is necessary to provide accurate information for decision-making and for management of funds made available by local, state, and federal governments for education. Recent accountability demanded by the community brings the

expectation that modern education must be fully planned and offered in a precisely controlled manner. The educational system in the state of Oregon must be in attunement to each individual as he grows and matures in our ever-changing society or else it will lose its impact on the problems and needs of the people which occupational education is intended to serve.

CHAPTER III

PROCEDURAL DESIGN OF THE STUDY

For the purpose of developing a more accurate and effective assessment model, an empirical investigation of the need for full-time instructors of occupational subjects in Oregon's community colleges was conducted. (A detailed description of the assessment model is found on pages 35-39.) It has been indicated that an accurate and effective assessment model would provide valuable assistance to those persons who are directly responsible for the administration of the occupational programs and who need to know the supply and demand of occupational instructors. The following summary of procedures employed in the study is provided to delineate the specific steps taken during the investigation.

Data Collection

Data relative to what present and projected employment need for full-time instructors of occupational subjects was collected from the occupational directors of each community college by telephone, written communication, and personal interview, using a common interview guide (Appendix A), which was designed to standardize the required elicited responses to the carefully prepared questionnaire. Specific relevant instructions were orally interpreted to each selected person from a prepared questionnaire instruction sheet (Appendix A).

The instrument (Appendix A) was of an inventory questionnaire type, and was so designed that it would help eliminate any error attributed to a generally found wide variety of overlapping course descriptions and program titles. This was achieved by using an official Oregon Board of Education community college course listing (Appendix B).

Used for the development of the assessment model was a prepared checklist which provided for indication of current instructor employment need and also for a five-year instructor employment need estimate. Over 132 current occupational offerings were listed within the instrument, and, to insure even greater comprehensiveness, additional space was provided. In the event that additional approved occupational offerings were in effect, they too would be listed and become a part of the data and be treated accordingly.

The next instrument developmental step required that permission be received from the Oregon Board of Education for the purpose of visiting each community college, necessary for the development of this assessment model and also for further assurance that a need for this assessment model existed. Permission was granted. The letter of transmittal found in Appendix B indicates that there is an urgent need for this assessment of instructor need.

Subjection to a jury of experts became the next step. This was for the purpose of evaluating the instrument in relation to format,

content, comprehensiveness, and clarity. Each jury member was asked to review the questionnaire, the common interview guide, and the instructions to the questionnaire. The jury of experts consisted of nine persons who currently represent nine community colleges and have the responsibility for the individual college-wide administration of the program of occupational education in the state of Washington. Evaluative comments indicated that a revision of format pertaining to clarity of instruction was needed if pertinent data were to be received. It was indicated that the questionnaire instructions should include determination criteria which would be valuable in determining for which occupational program an instructor was or would be hired. It was also indicated that an instructor is usually not employed for teaching specifically in one single discipline, but that a related combination of discipline teaching expertise is required. Questionnaire instructions now include directions toward inquiring for which major area of instruction the instructor initially was or would be hired. All other evaluative comments indicated that a further change in format was not necessary.

Population

The study's population was comprised of the total number, 13, of community colleges in the state of Oregon. A listing of the colleges is found in Appendix B. Found in this listing are the person/persons who

were selected because they were logically representative of the person who was required to complete the questionnaire. Positions held by these persons are indicated on the listing. Biographical and demographical data concerning the population were obtained from Oregon Board of Education records, previously gathered from the institutions. Because of administration changes and administrative title changes, each person was contacted by telephone and in writing for the purpose of determining if he was the person who would be able to answer all questions found in the common interview guide (Appendix A). Assurance of correctly selected persons resulted in a personal contact and interview.

Respondent Contacts

Data were collected by personal interview and using a prepared questionnaire. This procedure was utilized in order that the reporting task would gain greater validity and to further develop a more positive attitude of the school administrators toward the acceptance of recognizing a need for the making more accurate and effective assessments of instructor supply and demand. Recognition was given to the extra-long length of the questionnaire, the specific instructions, the instrument marking procedures, and the busy schedules of the persons contacted.

Treatment of Data

Procedures utilized in analyzing the data which were collected for the purpose of assessing the need for instructors of occupational subjects in Oregon's community colleges include the following:

1. In order to determine if there was any significant relationship between the needs for the 1971-72 school year and the 1976-77 occupational instructor estimates for Oregon's occupational education programs, the coefficient of correlation between 1971-72 and 1976-77 estimates was found, using the pooled grouping or clusters of occupational programs, as shown in Appendix C. The data were arranged in rank order and Spearman's coefficient of correlation was found to be 0.86, which was significant at the .01 level in a two-tailed test. The null hypothesis was rejected. It was proposed that a significant relationship existed between the 1971-72 occupational instructor employment needs and the 1976-77 estimates for the same needs in Oregon's occupational education programs.
2. In order to determine if there was any significant difference in mean estimates between 1971-72 and 1976-77 occupational instructor needs in Oregon's occupational education programs, several steps were followed:

- a. The mean estimates and position needs were calculated.
- b. An F-test was computed to determine the homogeneity of variances, and a significant difference in variability was found between the 1971-72 needs and the 1976-77 estimates.
- c. The Cochran and Cox method for non-homogeneous samples was used and the t-value was found to be 2.79, which was significant at less than .01 level in a two-tailed test. The null hypothesis was rejected.

It was proposed that a significant difference existed between the two mean estimates. Since the mean estimate for the 1976-77 school year was found larger than the mean estimate for 1971-72, and since the difference between the two mean estimates was found significant, it was proposed that, on the average, Oregon's community college occupational education programs were expected to experience a significant growth of about 34 percent in the following five years, as evidenced by their demand for occupational instructors.

Detailed Description of Model

1. Definition of the problem: An urgent need to assess and the need for an accurate and effective instructor need assessment model is indicated by the review of literature,

personal interview, written communication, and telephone.

2. Selection or creation of appropriate data-gathering techniques: For a complete listing of all occupational programs offered by the total number of community colleges in the state of Oregon, a listing edited by the Oregon Board of Education was used. This listing of programs was already clustered into groups of occupations that had similar commonalities. Dr. Wayne Courtney, Oregon State University faculty statistician, assisted in the design of the statistical treatment of the collected data. The instrument was so designed that rather than indicating one projection estimate, three estimates were asked. This in itself is unique to this assessment model, because the basic statistical assumption of the statistical treatment known as Program Evaluation and Review Technique (PERT) has a basic statistical assumption that there is no more than one chance in a hundred for error in estimation. Use of this statistical technique with a process of personal interview, and using a common interview guide for the purpose of accurately marking the questionnaire, tended to realistically gather more valid present and projected occupational instructor need. This assessment model became

comprehensive as it used for a sample the total number of community colleges in the state of Oregon and the total number of occupational programs offered by these community colleges. Only the full-time instructors were considered for this assessment model.

3. **Classification and Analysis of Data:** The importance of this assessment model is increased by recognition given to the fact that the statistical treatment of the data can be computed with a desk calculator, thereby permitting persons with limited funds and statistical knowledge to use this assessment model when the need to assess becomes evident. It has been indicated that even though the need to assess is often recognized, funds for computer time, a capable statistician, and an accurate, effective assessment model are not available. The analysis of data included the use of an analysis of variance test, which determined if there was any significant difference of the two mean estimates. This testing did reveal the degree of variation and indicated the level of reliability of the collected data. An F-test was then computed to determine if there was a significant difference in variability. The Cochran and Cox method was used to test for non-homogeneous samples for determining the t-value, which would indicate the level of significance in a

two-tailed test. The statistical approach that we used for the uncertainty factor of the five-year instructor estimate was the Program Evaluation and Review Technique. This has been found to have a definite application in educational research. This technique utilized three estimates, which renders it statistically correct to assume that the three instructor estimates form a Beta distribution (formula found in Appendix E). An important consideration required to use PERT is that the instructor need estimates must be secured from the persons responsible for the college-wide administration of the occupational education program. In order to insure that the correct persons would be involved in the assessment, an identification process consisted of written communication, telephone, and personal interview.

4. **Conclusions and Implications:** Success in the development and subsequent testing of this instructor need assessment model is attributed primarily to the use of the personal contact and interview technique. This proved to be the motivation which resulted in gaining more accurate responses to the prepared questionnaire. The statistical design developed for treatment of the collected data proved to be of great value; not only is the statistical computation extremely accurate, but it also does indicate to the person/persons who

will use this assessment model that this effective technique is easily understood, thereby alleviating a possible deterrent to make an assessment caused by lack of statistical knowledge. Indicated community college growth demands that any assessment must be reassessed and revalidated within a reasonable length of time. This particular instructor need assessment should be performed at least every two years in order to keep the data pertaining to the supply and demand of occupational instructors current.

CHAPTER IV

FINDINGS

In the previous chapter, the instrument and sources of data for the present study, which had as the main objective the formulation of an accurate and effective instructor assessment model, were described. This chapter will present the findings and analyze the results.

Tabulation

Eight occupational education programs had more than one full-time instructor need for the 1971-72 school year. The needs and comparative ranks for these programs are shown in Table 1.

Table 1. Occupational instructor needs in those occupational programs that reported more than one employment need for the 1971-72 school year, by comparative rank.

Occupational education programs	1971-72 Employment needs	Comparative ranks
Accounting/General Business	4	2
Auto Mechanics	4	2
Data Processing	4	2
Forest Technology	3	4
Horseshoeing	2	6.5
Commerical Food Preparation	2	6.5
Law Enforcement	2	6.5
Real Estate Technology	2	6.5

The percentages of increase/decrease in the supply of occupational instructors were determined by dividing the needs of each

occupational education program at the date of this assessment by those at the end of the previous school year. From the 42 occupational education programs which reported instructor needs for the end of the 1970-71 school year, 27 still had all or some of the employment needs on the date of this assessment. The percentages presented in Table 2 (page 42) indicate the increase/decrease in the need for instructors.

By comparing Tables 1 and 2, it was evident that the two programs which had the highest number of instructor need increase were: (1) Data Processing, and (2) Accounting/General Business. This indicated increase will become more evident with further analyzation of the collected data.

From the 132 occupational programs whose needs for the 1976-77 school year were reported, 17 programs had more than three vacancies. These most likely estimates were summarized, ranked, and presented in Table 3 (p. 43).

By comparing Tables 1 and 2, it was found that only one program had a significant rank gain, Accounting/General Business.

The next step of the present study followed the assumption that the occupational education programs as recorded on the questionnaire could and needed to be grouped into clusters or groups of similar or related occupational programs. This assumption facilitated the analysis of the data and it was also expected that the grouping would provide a more realistic representation of the needs for program

Table 2. Percentages of increase/decrease in the employment need of full-time instructors of occupational subjects in Oregon's community colleges, 1970-71 school year.

Occupational education programs	1970-71 Instructor need	1971-72 Instructor need	Percentage of increase/ decrease
Auto Mechanics	4	4	0
Home Economics	3	1	- 66.7
Practical Nursing	3	2	- 33.3
General Office	3	4	33.3
Child Care	3	0	-100
Real Estate Technology	3	3	0
Forest Technology	2	3	50
Data Processing	2	5	150
Law Enforcement	2	3	50
Supervision	2	1	- 50
Welding	2	1	- 50
Environmental Technology	2	0	-100
Dental Assistant	2	1	- 50
Commercial Food Preparation	2	3	50
Body and Fender	2	1	- 50
Diesel	2	1	- 50
Secretarial	2	2	0
Key Punch	1	1	0
Business Mid-Management	1	1	0
Medical Records Technician	1	1	0
Business Machines Technology	1	1	0
Fisheries	1	0	-100
Range-Forestry Technology	1	0	-100
Radio Broadcasting	1	0	-100
Cosmetology	1	0	-100
Foreign Auto Mechanics	1	0	-100
Bookkeeping/Clerical	1	0	-100
Landscaping	1	1	0
Dental Hygienist	1	0	-100
X-Ray Technology	1	0	-100
Commercial Art	1	0	-100
Civil Engineering	1	1	0
Drafting	1	1	0
Electronic Engineering	1	0	-100
Highway	1	1	0
Graphic Arts	1	1	0
Machine Shop Technology	1	0	-100
Farm Management	1	1	0

(Continued on next page)

Table 2. (Continued)

Occupational education programs	1970-71 Instructor need	1971-72 Instructor need	Percentage of increase/ decrease
Accounting/General Business	1	4	300
Livestock Technology	1	0	-100
Business and Commerce	1	0	-100
Horseshoeing	1	2	100

Table 3. Occupational instructor needs in those occupational programs that reported more than three employment needs for the 1976-77 school year, by comparative rank.

Occupational education programs	1976-77 Instructor need	Comparative ranks
Accounting/General Business	16	1
Auto Mechanics	15	2
Welding	13	3
Data Processing	12	4
Practical Nursing	10	6
General Office	10	6
Business Mid-Management	10	6
Secretarial	9	8
Law Enforcement	8	9
Civil Engineering	7	10
Drafting	6	11.5
Electronic Engineering	6	11.5
Radio Broadcasting	5	14
Transportation and Distribution	5	14
Forestry Technology	5	14
Mechanical Engineering	4	16.5
Forest Products Technology	4	16.5

development at Oregon State University, as well as other occupational instructor preparation agencies. The problem of selecting the criteria for grouping was solved by using one major reference, an official comprehensive programs listing published by the Oregon Board of Education. This listing is found in Appendix G.

Table 4 presents a summary of present and projected needs for full-time instructors of occupational subjects in Oregon's community colleges, relating both 1971-72 and 1976-77 school years and the comparative rank of each cluster of occupational clusters. This table seemed to offer a more realistic presentation in terms of program development for teacher education, as indicated by the occupational directors.

Table 4. Present and estimated instructor needs for the clustered grouping of occupational programs offered in Oregon's community colleges, 1971-72 and 1976-77 school years.

Clustered groups	1971-72 Instructor needs	Rank	Estimated 1976-77 instructor needs	Rank
Office Occupations	27	1	57	1
Trades and Industry	16	2	54	2
Health Occupations	12	3	42	4
Marketing/Management	11	4	31	5
Technical	7	5.5	45	3
Agriculture	7	5.5	11	9
Service Occupations	6	7	18	6
Home Economics	5	8	12	7.5
Forestry	4	9	12	7.5
Marine Technology	2	10	2	10

Note: 1976-77 Instructor estimates have been rounded to the nearest indicated total individual cluster instructor need.

By comparing Tables 1, 3, and 4 it was found that several programs indicated movement in rank when clustered.

From the clustered grouping of occupational programs in Table 4, three had comparative rank gain of one or more units, while four had losses of one or more. These facts are illustrated in Tables 5 and 6. The remaining three clusters indicated no change in comparative rank. Interesting relationships are found by review: (1) The technical programs cluster appears to be the area of greatest instructor need in the next five years in Oregon, as indicated by the related rank gains and comparative rank order of instructor needs for the 1976-77 school year; (2) Health Occupations, Agriculture, Marketing/Management, and Marine Technology clustered programs appear to be requiring less instructor need in the next five years in Oregon, as indicated by their rank losses and relative rank order of instructor needs for the 1976-77 school year.

Analysis

The analysis of the data for this study has immediate value for the accurate planning of occupational instructor need for the community colleges in the state of Oregon. Much past and present national and local research has been concerned primarily with teaching methods and techniques with little or nothing done concerning the faculty needs. This immediate need assessment model with its

Table 4. Occupational education program clusters that had comparative rank gains in relation to occupational instructor need estimates for the 1971-72 and 1976-77 school years.

Occupational program cluster	1971-72		1976-77		Comparative rank gain
	Instructor need	Rank	Instructor need	Rank	
Technical	7	5.5	45	3	2.5
Service Occupations	6	7	50	6	1
Forestry	4	9	22	7.5	1.5

Table 5. Occupational education programs that had comparative rank losses in relation to occupational instructor need estimates for the 1971-72 and 1976-77 school years.

Occupational program cluster	1971-72		1976-77		Comparative rank loss
	Instructor need	Rank	Instructor need	Rank	
Health Occupations	12	3	42	4	-1
Agriculture	7	5.5	11	9	-3.5
Marine Technology	2	9	2	10	-1
Marketing/Management	11	4	31	5	-1

five-year projection had, for the purpose of collecting and analysis of data, two major objectives: (1) To test any possible relationship between the full-time instructor need for the 1971-72 school year in Oregon's community college occupational education programs and the estimation for the 1976-77 school year in the same programs. The answer to this question is found to be necessary because in all fields of science and human endeavor, one of the main objectives is to acquire knowledge of relationships between variables. An example attesting to the importance of this may be the discovery of a relationship between smoking and the incidence of lung cancer. A knowledge of the existence of a relationship gained by its discovery from statistical data analysis frequently leads to further research and findings of great practical importance. (2) To test the significance of the mean estimate of full-time instructor needs for the 1971-72 school year with the mean estimate of the 1976-77 full-time instructor need. In order to answer this question it was found necessary to follow the analysis of variance procedures; this process consists of a comparison of two independent estimates, in the case of this study, the 1971-72 and the 1976-77 instructor estimates were those two independent estimates of the universe variance. Determination from the use of this test will indicate that if the difference between the two estimates is relatively small, it may be attributed to chance alone and the universe may be considered as homogeneous. On the other hand, if the difference is

large enough to be considered statistically significant, the hypothesis that the two estimates refer to the same homogeneous universe will be rejected. The major importance of this test is the discovery of the degree of variation, which will indicate the level of reliability of the collected data.

The first objective was accomplished by finding the coefficient of correlation between the 1971-72 instructor needs and 1976-77 estimates, using the clustered grouping of occupational programs as indicated in Table 4. The data were arranged in rank order and the Spearman's coefficient of correlation was found to be 0.85, which was significant at the .01 level in a two-tailed test. The null hypothesis was rejected. It was proposed that a significant relationship existed between the 1971-72 estimates for occupational programs in Oregon's community colleges.

The second objective was accomplished in several steps: (1) the mean estimates and vacancies were calculated; (2) an F-test was computed to determine the homogeneity of variances, and a significant difference in variability was found between the 1971-72 instructor needs and the 1976-77 instructor need estimates; and (3) the Cochran and Cox testing method for non-homogeneous samples was used, and the t-value was found to be 2.79, which was significant at less than .01 level in a two-tailed test. The null hypothesis was rejected. It was proposed that a significant difference existed between the two mean

estimates. Since the mean estimate for the 1976-77 school year was found larger than the mean estimate for 1971-72, and since the difference between these two mean estimates was found significant, it was proposed that, on the average, the Oregon occupational education programs were expected to experience a 34 percent growth in the next five years, as evidenced by their demand of occupational instructors.

The statistical approach that was used for uncertainty, the factor of the five-year instructor estimate, was the Program Evaluation and Review Technique, which has been found to have definite application in educational research. A single estimation could have been used, but the usual procedure is to secure three estimates in events where uncertainty regarding the estimation must be considered. These three estimates are indicated as the most likely, the optimistic, and the pessimistic on the instrument used for this projection model assessment. The most likely estimate is, in the estimator's judgment, which in the case of this study is the occupational dean, the instructor need that will occur under normal circumstances. The optimistic estimate is the least instructor need that will occur under the most optimum conditions. The pessimistic estimate assumes that anything can go wrong with the instructor need, short acts of God. This estimate includes consideration of the most adverse conditions.

The basic statistical assumption considered with the use of PERT for this study was that the three instructor estimates form a Beta

distribution, and experience has substantiated this appraisal. It was necessary that the estimates be secured from the person responsible for the total occupational program; in the case of this study, it was the occupational deans of the community colleges who contributed the instructor estimates.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

Detailed review of written related literature, spanning a period of over 20 years, clearly has indicated that on a national level, as well as on a state level, the community college student enrollments are increasing. The rate of increase has many times exceeded planned estimates, not only those estimates pertaining to student enrollment, but also those estimates of instructor need. Often the rate of increase has outstripped the planned instructor resources because there is no accurate and effective method with which to make the assessment of the supply and demand of occupational instructors in specific subject areas.

The importance of being able to project accurately the supply and demand for occupational instructors cannot be minimized. It is essential that careful planning be made well in advance of the demand for faculty because budgeting is especially critical. Poor planning or underestimation of instructor need often results in the limitation of educational opportunity, while the overestimation of instructor need often results in poor allocation of scarce fiscal resources. An assessment, including a projection model, was indicated to be needed from

the review of literature for the purpose of gaining valuable insight which will aid in realistic community college faculty planning operation. The educational philosophy of the community college is that of an outgrowth of the social and economic needs of the community which it serves. The high mobility of both students and instructional faculty alike indicate a need to know the supply and demand of these instructors. There is an immediate need for utilizing an assessment procedure that will not only accurately indicate today's instructor need, but which will also project into the future.

Review of the literature indicates further that people today have a decided thirst for knowledge and a desire for career success, as evidenced by the swelling community college enrollment statistics, resulting in the expansion and growth of our community colleges. Financing, facilities planning, curriculum development, and staffing are among other problems that come with growth and expansion. Fortunately these problems are welcomed by competent administrators involved in operating our community college system; it does seem rather startling that our complex and sizeable community college system does not have an effective method of assessing the needs for occupational instructors, this may be attributed to the multiple roles of our community colleges. This multiplicity tends to complicate establishing or developing an effective instructor need assessment.

Conclusions

Pertaining to the development of the assessment model:

1. The personal contact and interview technique used for the development of this assessment model has proved to be the major motivational factor, which resulted in collecting more accurate data pertaining to the present and projected need for occupational instructors. A more positive attitude of the occupational deans toward the necessity of making more accurate and effective assessments was developed through the process of their assisting with this assessment model.
2. It became evident to the occupational deans, while being interviewed, that even though they may have impressions pertaining to the supply and demand for occupational instructors, their impressions could not be reliable prior to a systematic assessment.
3. A total of 66 full-time occupational education instructors in 42 of Oregon's 132 State Board of Education listed community college occupational programs were needed at the end of the 1970-71 school year. From that same total, 70 instructor needs in 29 programs still remained at the time of this assessment, March 20, the approximate latter half of the 1971-72 school year.
4. Four identified major occupational program clusters have 40 out of the 66 employment needs reported for the 1970-71 school

year. These four clusters were: (1) Health Occupations, (2) Home Economics, (3) Office Occupations, and (4) Trade and Industry. This represented 61 percent of the instructor needs for that year. With the exception of Home Economics, the other three clusters already identified as having the greatest need for the 1970-71 school year still had the highest deficiencies of instructor supply at the time of this assessment. The cluster Marketing/Management, replaced Home Economics with a higher degree of deficiencies of instructor supply.

5. A total of 284 instructors of occupational education was estimated as needed in 132 of Oregon's community college occupational education programs that will be offered by the 1976-77 school year.
6. Four identified major occupational program clusters--Trade and Industry, Office Occupations, Technical, and Health Occupations--had 198 out of the 284 instructor employment needs estimated for the 1976-77 school year. This represented 70 percent of the needs estimated for that year.
7. If comparative rank of instructor employment needs is accepted as an indication of program status among the occupational areas, the technical programs cluster will have the most growth of Oregon's occupational programs during the next five years. Clusters Service Occupations, Forestry, and Home Economics

follow close behind the cluster Office Occupations in programs which will have considerable growth during the same period. The clusters Health Occupations, Agriculture, Marine Technology, and Marketing/Management are examples of Oregon's community college occupational education programs that will have the most significant comparative rank loss, which indicates less growth, during the next five years.

Recommendations

Based upon the preceding review of the literature, the findings of this study, and subsequent conclusions, the following implications are proposed:

1. While the particular findings of the present study may be restricted to the community colleges of the state of Oregon, the assessment model is believed to have been sufficiently suggestive to warrant its use in a similar assessment of persons in other occupational education service needs as well as the Department of Employment, MDTA, and other similar private and public, federal and state agencies who are in the education sector.
2. Surveys similar to this one should be conducted every two years, so the data can be reassessed and validated, and a distribution of indexes of supply/demand can be established

as an indicator for the occupational instructor education program development.

3. The instructor need data compiled for this instructor need assessment, which included a five-year projection for the same need, does possibly indicate that the occupational education directors are foreseeing the future need for occupational programs that will be different from the existing programs.
4. A similar study should be conducted to cross-validate the results of this survey by analyzing the national and state needs for graduates of occupational education programs in the next five years and testing any possible relationship with the needs for instructors of occupational education, as assessed by this study.
5. If the findings of this study are accepted, a study should be conducted to determine how the future needs for occupational instructors are going to be met for each occupational program in Oregon's community colleges.

BIBLIOGRAPHY

1. Atteberry, Pat H. Problems and procedures related to the articulation of two-year technical programs. *Journal of Industrial Teacher Education* 8:35-40. Summer, 1971.
2. Berelson, Bernard. Graduate education in the United States. New York, McGraw-Hill, 1960. 345 p.
3. Blocker, Clyde E. Are our faculties competent? *Junior College Journal* 36:12-17. December, 1965.
4. Brunner, Ken A. and Clarence B. Lindquist. Recent faculty and instructional practices in Junior colleges. *Junior College Journal* 30:327-339. 1960.
5. Champion, Howard A. Financing the public junior college. *National Education Association Journal* 53:67-68. October, 1964.
6. Can we get enough good teachers? *Junior College Journal* 34:3-7. December, 1963.
7. Carnegie Commission on Higher Education. The open-door colleges, policies for community colleges. New York, McGraw-Hill, 1970.
8. Chambers, M. M. Six rules for economizing in higher education. *Journal of Higher Education* 33:83. January, 1962.
9. Charles, Searle F. Building a junior college faculty. *Junior College Journal* 29:421-423. March, 1959.
10. Cochran, William G. and Gertrude M. Cox. Experimental designs. New York, Wiley, 1950. 454 p.
11. Conference Committee on the Preparation of Instructors for Junior Colleges and Technical Institutes, Council on Cooperation in Teacher Education. Wanted: 30,000 instructors for community colleges. Washington, D.C., American Council on Education, 1949. 51 p.
12. Cook, Desmond L. Program evaluation and review technique applications in education. Washington, D.C. United States

- Department of Health, Education, and Welfare, Office of Education. United States Government Printing Office, 1966. 100 p.
13. Cox, D. R. Planning of experiments. New York, Wiley, 1958. 308 p.
 14. Davies, Don. The teacher number game. American Education 6:7-8. October, 1970.
 15. Davies, Don. Which statistics do you read? American Vocational Journal 45:90-94. 1970. 76 p.
 16. Dobrovolny, Jerry S. Preparation of junior college teachers of technical subjects. Junior College Journal 35:9-13. December, 1964.
 17. Dunham, Ralph E. Faculty and other professional staff in institutions of higher education. First term 1963-64. Final report, Washington, D. C., United States Department of Health, Education and Welfare, 1966. 100 p.
 18. Eckert, Ruth E. and John E. Stecklein. Career motivation and satisfactions of junior college teachers. Junior College Journal 30:327-339. 1960.
 19. Editorial. Emphasis 1971 fall enrollment. The Junior College Journal 42:3. December, 1971/January, 1972.
 20. Eells, Walter C. The junior college. Massachusetts, The Riverside Press, 1931. 833 p.
 21. Eurich, Alvin C. Staffing junior colleges. Junior College Journal 33:8-12. March, 1963.
 22. Fields, Ralph R. The community college movement. New York, McGraw-Hill, 1962. 360 p.
 23. Fletcher, Leon. Take to the road, teacher! Junior College Journal 37:19-21. October, 1966.
 24. Flint, Calvin C. Securing and organizing a staff at Foothill College. Los Angeles, University of California, Junior College Leadership Program, Occasional Report Number 5, 1964. p. 89-92.

25. Florida State University. Teachers for the community junior colleges of Florida. Tallahassee, 1957.
26. Frederick, Lee M. Teaching opportunities. Washington, D. C., United States Department of Health, Education, and Welfare, Office of Education. United States Government Printing Office, 1964. 109 p.
27. Glass, G. V. and Julien C. Stanely. Statistical methods in education and psychology. New Jersey, Prentice-Hall, 1970. 596 p.
28. Gleazer, Edmund J., Jr. American Association of Junior Colleges, faculty development approach. Junior College Journal 38:7. 1968.
29. Gleazer, Edmund J., Jr. American junior colleges. Washington, D. C., American Council on Education. 5th edition, 1960. 564 p.
30. Gleazer, Edmund J., Jr. Junior college explosion. American Education 5:12-13. January, 1969.
31. Gleazer, Edmund J., Jr. The 1971 junior college directory. Washington, D. C., American Association of Junior Colleges, 1971. 116 p.
32. Gleazer, Edmund J., Jr. The 1969 junior college directory. Washington, D. C., American Association of Junior Colleges, 1969. 109 p.
33. Green, Charles B. The problems of the beginning junior college instructor. Ed. D. thesis. Los Angeles, University of California at Los Angeles, 1960. 305 p.
34. Harper, William A. How community colleges are organized, started, and controlled. Nation's Schools 77:53-56. February, 1966.
35. Harris, Norman C. Curriculum and instruction in occupational education. Addresses and recommendations presented at a conference sponsored by the Midwest Technical Education Center and the American Association of Junior Colleges. St. Louis, Missouri, American Association of Junior Colleges, 1966. 83 p.

36. Harris, Norman C. Major issues in junior college technical education. *Educational Record* 45:128-138. Spring, 1964.
37. Holy, T. C. A study of faculty demand and supply in California higher education, 1957-1970. California, University of California, Berkeley, 1958. 76 p.
38. Hooper, Mary E. Associate degrees and other formal awards below the baccalaureate, 1968-69. Washington, D.C. United States Department of Health, Education, and Welfare, June, 1969. 118 p.
39. Johnson, Lamar B. Islands of innovation expanding: changes in the community college. California, Glencoe Press, 1969. 352 p.
40. Justman, Joseph. College teaching: its practice and its potential. New York, Harper and Row, 1956. 257 p.
41. Kinsinger, Robert E. Stretching instructional talent. *Junior College Journal* 35:22-25. October, 1964.
42. Littlefield, Henry W. Critical issues facing America's junior colleges. *Junior College Journal* 31:361-364. March, 1961.
43. Lombardi, John. Occupational education in California junior colleges. *Educational Record* 45:142-147. Spring, 1964.
44. Maul, Ray C. The biggest problem: finding good teachers. *Junior College Journal* 36:508. December, 1965.
45. McGrath, Earl J. Liberal education in the professions. New York, Teachers College, Columbia University, 1959. 63 p.
46. McKeachie, Wilbert J. The instructor faces automation. *Improving College and University Teaching* 8:91-95. Summer, 1960.
47. Medsker, Leland L. Let's take a look at the junior college picture. *National Education Association Journal* 47:628-630.
48. Nerden, J. T. New perspectives for vocational teachers. *American Vocational Journal* 41:21-22. May, 1966.
49. Nixon, Richard M. Message on higher education. *American Education* 6:28-31. October, 1970.

50. Oosting, Kenneth W. Equating faculty loads. *Junior College Journal* 36:10-11. May, 1966.
51. Oregon. State Board of Education. Counselors' handbook on community colleges in the State of Oregon. Salem, State Department of Education, 1969. 95 p.
52. Oregon. State Board of Education. Summary of the Oregon Board of Education biennial report of the 1968-70 period. Salem, State Department of Education, 1971. 5 p.
53. Oregon. State Board of Education. The inside story. Salem, State Department of Education, January, 1972. 4 p. (Mimeographed)
54. Oregon. State Board of Education. 1971 biennial report. Salem, State Department of Education, 1971. 162 p.
55. Price, Hugh G. Report of the California state-wide conference on the preparation, credentialing, recruitment, and placement of junior college teachers. March 28-29, 1958. Sacramento, California State Department of Education, July, 1958. 63 p. (Mimeographed)
56. Putnam, John F. Standard terminology for curriculum and instruction in local and state school systems. Washington, D. C., United States Department of Health, Education, and Welfare, 1970. 319 p.
57. Roger, James F. Staffing American colleges and universities. Washington, D. C., Office of Education, United States Department of Health, Education, and Welfare, 1967. 220 p.
58. Rollins, Charles E. Planning for flexible growth. *Junior College Journal* 35:31-32. May, 1965.
59. Russo, Michael. Fourteen million vocational students by 1975. *American Education* 5:10-11. March, 1969.
60. Sarko, L. Problem of teaching in community colleges. *Journal of Higher Education* 35:384-86. 1964.
61. Smith, Kerry G. Pressures and priorities in higher education, current issues in higher education. Washington, D. C., National Education Association of the United States, 1965. 262 p.

62. Steel, R. G. D. Principles and problems of statistics. New York, McGraw-Hill, 1960. 481 p.
63. Stivers, E. R. Teaching loads in the junior college. Junior College Journal 32:229. January, 1961.
64. Suess, Alan R. Current and anticipated demand for technical teachers. Journal of Industrial Education 5:39-43. Spring, 1968.
65. Tickton, Sidney G. What is ahead for public junior colleges? Junior College Journal 34:9-11. November, 1963.
66. Thornton, James W. The community junior college. New York, John Wiley and Sons, Inc., 1960. 300 p.
67. Unikel, Graham. Training technical communicators. Junior College Journal 35:28-32. March, 1965.
68. United States Department of the Navy, PERT summary report, phase I. Washington, D. C. Special Projects Office. July, 1958. Appendix B 2, 3, and 4.
69. United States Office of Education. Division of Higher Education. Staffing the nation's colleges and universities. Washington, D. C., Department of Health, Education, and Welfare, 1957. 59 p.
70. Wattenbarger, James L. Guidelines for securing and organizing staff for a new junior college. Los Angeles, University of California, Junior College Leadership Program, Occasional Report Number 5, 1964. p. 81-88.
71. Weldon, Herbert. Experiment in faculty planning. Junior College Journal 35:28-30. April, 1965.
72. Wood, William R. Professional personnel for community colleges. Junior College Journal 20:513-22. May, 1950.

APPENDICES

APPENDIX A

Common Interview Guide
Questionnaire Instruction Sheet
Assessment Instrument

PROJECTION MODEL ASSESSING THE NEED FOR FULL-TIME
INSTRUCTORS OF OCCUPATIONAL SUBJECTS IN
OREGON'S COMMUNITY COLLEGES

COMMON INTERVIEW GUIDE

For the purpose of standardizing the required elicited responses to the prepared questionnaire, the following questions were asked of each participant:

1. Is information regarding occupational instructors available which:
 - a. Indicates whether each instructor is full- or part-time?
 - b. Indicates whether part-time instructors actually are part-time, or whether they spend the rest of their time instructing in another subject area?
 - c. Indicates what occupational area each instructor is in?
 - d. Indicates whether the instructors are directly instructing in occupational programs?
2. What full-time, new position needs existed on June 1, 1971? This response will indicate the need existing at the end of the 1970-71 school year. Position needs due to resignation, retirement, or death are not considered in this entire assessment.
3. What full-time, new position needs exist today (date of interview)?
4. A five-year estimation of new employment needs is an integral part of this survey. Your response is required for indication of:
 - a. What is the number of new position needs that will occur under normal circumstances of program growth?
 - b. What is the number of new position needs which emerging programs are expected to introduce, affecting staff demands? The assumption can only be made that the programs are going to have exceptional growth, having no more than one chance in a hundred of occurring.
 - c. What would be the new position needs if imprevisible factors would interfere with the normal development of the program? Please take into account the most adverse conditions, having no more than one chance in a hundred of occurring.

- d. What additional occupational programs do you have at this college, which are not listed on the questionnaire? If there are additional programs, we will use the same procedure as we have for the listed programs.

ASSESSMENT OF PRESENT AND PROJECTED NEED FOR FULL-
TIME INSTRUCTORS IN THE OCCUPATIONAL PROGRAMS
OF OREGON'S COMMUNITY COLLEGES

INSTRUCTIONS TO THE QUESTIONNAIRE

- A. The purpose of the study is to assess present and projected need for instructors in the occupational programs. These needs are to be assessed for the 1971-72 school year (current) and for 1976-77 (five-year estimates).
- B. Please complete the form on the basis of a completely organized college or presently proposed expansion. The section of current new position needs has two columns. The first column refers to the new position needs that existed for June 1, 1971. This indicates the need existing at the end of the 1970-71 school year. The second column refers to additional new position needs existing at the time when the questionnaire is being filled out.
- C. The five-year estimates are to be filled out in three different columns:
1. THE MOST LIKELY, which is the number of new position needs that would occur under normal circumstances of program growth.
 2. THE OPTIMISTIC, which is the number of new position needs when emerging programs are expected to introduce sudden changes in staff demands. The assumption can be made that the programs are going to have an exceptional growth, having no more than one chance in a hundred of occurring. EXAMPLE: Our country today is attacked and WW III is declared. Health occupation training need suddenly increases.
 3. THE PESSIMISTIC, which is the overly conservative estimate. The assumption can be made that imprevisional factors would interfere with the normal development of the program. It should take into account the most adverse conditions, having no more than one chance in a hundred of occurring. EXAMPLE: All gasoline and diesel powered vehicles ordered destroyed by presidential executive order. Mechanic training program's normal development is interfered with.

- D. Please insert additional subject areas in the spaces provided at the end of each group. Complete current and five-year estimates for such additions.

IMPORTANT NOTE:

This assessment does not consider instructor need due to resignation, retirement, or death.

ASSESSMENT OF PRESENT AND PROJECTED NEW POSITION
NEED FOR FULL-TIME INSTRUCTORS IN THE OCCUPA-
TIONAL PROGRAMS OF OREGON'S
COMMUNITY COLLEGES

To: _____, Director of Occupational,
Technical, and Adult Education (Please read instruction sheet
before filling out this form)

Name of College _____

Location _____

Please Note: For even greater validity, additional blank spaces have been provided in the event that the field of study listing does not possibly include additional occupational programs which your college does offer. Please enter the title of the program and rate it as you have rated the already listed programs.

MAJOR OCCUPATIONAL PROGRAM CLUSTER

FULL-TIME OCCUPATIONAL INSTRUCTOR
NEW POSITION NEEDS

Current (71-72)	Five-year estimates(76-77)			
June 1, 1971	March 20, 1972	Opti- mistic	The most likely	Pessi- mistic

AGRICULTURE

1. Agriculture Business _____
2. Agriculture Equipment _____
3. Agriculture Technology _____
4. Farm Management _____
5. Fisheries _____
6. Floristry _____
7. Horticulture _____
8. Landscaping _____
9. Livestock Technology _____
10. Outdoor Recreation Conservation _____
11. Range Ranch Management _____
12. Seed Technology _____
13. Turf Management _____
14. Horseshoeing _____

MAJOR OCCUPATIONAL PROGRAM CLUSTER	FULL-TIME OCCUPATIONAL INSTRUCTOR NEW POSITION NEEDS				
	Current (71-72)		Five-year estimates (76-77)		
	June 1, 1971	March 20, 1972	Opti- mistic	The most likely	Pessi- mistic
<u>AGRICULTURE</u> (continued)					
15.					
16.					
17.					
18.					
<u>FORESTRY</u>					
1. Business Forestry					
2. Forest Products Technology					
3. Forestry Technology					
4. Range-Forestry Technology					
5.					
6.					
7.					
8.					
9.					
<u>HEALTH OCCUPATIONS</u>					
1. Dental Assistant					
2. Dental Hygienist					
3. Dental Technician					
4. Funeral Service Education					
5. Inhalation Therapy Technician					
6. Laboratory Assistant					
7. Medical Assistant					
8. Medical Laboratory Technician					
9. Medical Records Technician					
10. Nursing Assistant					

MAJOR OCCUPATIONAL PROGRAM CLUSTER	FULL-TIME OCCUPATIONAL INSTRUCTOR				
	NEW POSITION NEEDS				
	Current (71-72)		Five-year estimates (76-77)		
	June 1, 1971	March 20, 1972	Optimistic	The most likely	Pessimistic
<u>HEALTH OCCUPATIONS</u> (continued)					
11. Occupational Therapy Assistant					
12. Operating Room Technician					
13. Physical Therapy Assistant					
14. Practical Nursing					
15. Technical Nursing (ADN)					
16. X-Ray Technology					
17.					
18.					
19.					
20.					
21.					
<u>HOME ECONOMICS</u>					
1. Child Care					
2. Commercial Food Preparation					
3. Food Processing Technology					
4. Food Service					
5. Home Economics					
6. Homemaking Art					
7. Homemaking Business					
8.					
9.					
10.					
11.					
12.					

MAJOR OCCUPATIONAL PROGRAM CLUSTER	FULL-TIME OCCUPATIONAL INSTRUCTOR				
	NEW POSITION NEEDS				
	Current (71-72)		Five-year estimates (76-77)		
	June 1, 1971	March 20, 1972	Opti- mistic	The most likely	Pessi- mistic
<u>OFFICE OCCUPATIONS</u>					
<u>Accounting</u>					
1. Accounting/Gen. Business					
2. Bookkeeping/Clerical					
<u>Date Processing</u>					
3. Data Processing					
4. Key Punch					
<u>Clerical</u>					
5. Business and Commerce					
6. Clerk/Typist					
7. General Office					
8. Medical Receptionist					
9. Office Management					
<u>Secretarial</u>					
10. Business Machines Tech.					
11. Legal Secretarial					
12. Medical Secretarial					
13. Secretarial					
14.					
15.					
16.					
17.					
18.					
<u>MARINE TECHNOLOGY</u>					
1. Commercial Fisheries					
2. Marine Technology					
3. Oceanography					

MAJOR OCCUPATIONAL PROGRAM CLUSTER	FULL-TIME OCCUPATIONAL INSTRUCTOR				
	NEW POSITION NEEDS				
	Current (71-72)		Five-year estimates (76-77)		
MARINE TECHNOLOGY (continued)	June 1, 1971	March 20, 1972	Opti- mistic	The most likely	Pessi- mistic
4.					
5.					
6.					
7.					
8.					

MARKETING/MANAGEMENT

1. Agriculture Business					
2. Automotive Parts Mgt.					
3. Banking and Finance					
4. Business Forestry					
5. Business Mid-Management					
6. Commercial Art					
7. Fashion Merchandising					
8. Insurance					
9. Journalism Technology					
10. Merchandising (Pilot-Business)					
11. Radio Broadcasting					
12. Real Estate Technology					
13. Real Property Appraisal					
14. Sales and Marketing					
15. Television Broadcasting					
16. Transportation and Distr.					
17.					
18.					
19.					
20.					

MAJOR OCCUPATIONAL PROGRAM CLUSTER

FULL-TIME OCCUPATIONAL INSTRUCTOR
NEW POSITION NEEDS

Current (71-72)		Five-year estimates (76-77)		
June 1, 1971	March 20, 1972	Opti- mistic	The most likely	Pessi- mistic

MARKETING/MANAGEMENT (continued)

21.

SERVICE OCCUPATIONS

1. Air Traffic Management
2. Cosmetology
3. Criminal Justice Corrections
4. Educational Aide
5. Fire Protection (Science)
6. Funeral Services
7. Hotel/Motel Management
8. Institution Management
9. Instructional Materials Aide
10. Law Enforcement
11. Legal Aide
12. Library Aide/Assistant
13. Physical Education Rec. Asst.
14. Recreation Management Tech.
- 15.
- 16.
- 17.
- 18.
- 19.

TECHNICALAir

1. Air Transportation Technology
2. Airplane & Powerplant Mechanics

MAJOR OCCUPATIONAL PROGRAM CLUSTER	FULL-TIME OCCUPATIONAL INSTRUCTOR				
	NEW POSITION NEEDS				
	Current (71-72)		Five-year estimates (76-77)		
	June 1, 1971	March 20, 1972	Optimistic	The most likely	Pessimistic
<u>TECHNICAL</u> (continued)					
<u>Air</u> (continued)					
3. Aviation Maintenance					
4. Aviation Technology					
5. Flight Technology					
6. Pilot-Air Traffic					
7. Pilot-Business					
8. Pilot-Electrician					
9. Pilot Training					
<u>Engineering Technology</u>					
10. Civil Engineering					
11. Drafting					
12. Electronic Engineering					
13. Highway					
14. Mechanical Engineering					
15. Structural Engineering					
16. Surveying					
<u>Environmental Technology</u>					
17. Environmental Technology					
18. Water & Waste Water Tech.					
19. Water & Waste Water Treatment Plant Operator					
20. Well Drilling					
<u>Supervision</u>					
21. Supervision					
<u>Technical, Other</u>					
22. Graphic Arts					
23. Machine Drafting & Design Tech.					

MAJOR OCCUPATIONAL PROGRAM CLUSTER	FULL-TIME OCCUPATIONAL INSTRUCTOR NEW POSITION NEEDS				
	Current (71-72)		Five-year estimates (76-77)		
	June 1, 1971	March 20, 1972	Opti- mistic	The most likely	Pessi- mistic
<u>TECHNICAL</u> (continued)					
<u>Supervision</u> (continued)					
24. Office Machine Repair					
25.					
26.					
27.					
28.					
29.					
<u>TRADES AND INDUSTRY</u>					
<u>Construction</u>					
1. Architectural & Structural Tech.					
2. Architectural Drafting					
3. Construction Technology					
<u>Electrical</u>					
4. Electronics Service Technician					
5. Electronics Technology					
6. Pilot- Electronics					
7. Radio & TV Engineering Tech.					
8. Refrigeration (Appliances)					
9. Television & Radio Service					
10. Video Technology					
<u>Mechanical</u>					
11. Auto Mechanics					
12. Auto Service Station Specialist					
13. Body and Fender					
14. Diesel					
15. Foreign Auto Mechanics					

APPENDIX B

Oregon Board of Education Program Listings
Letter of Transmittal
Listing of Colleges and Occupational Directors

COMMUNITY COLLEGE OCCUPATIONAL PROGRAMS, 1970-71

NOTE: The following listing of community college programs reflects as accurately as possible the current occupational educational offerings of Oregon's 12 community colleges (one additional community college was organized with programs being offered in the 1971-72 school year). Most programs listed provide for a two-year associate degree program. However, since program emphasis may be geared to suit specific student and employment needs, the length may vary with some programs being one-year or less certificate type programs. Community colleges may also add or delete programs as need indicates.

Cluster	Blue Mountain	Central Oregon	Chemeketa	Clackamas	Clatsop	Lane	Linn-Benton	Mt. Hood	Portland	Rogue	Southwestern	Treasure Valley	Umpqua
<u>AGRICULTURE</u>													
<u>Agriculture Business</u>													x
<u>Agriculture Equipment</u>						x							x
<u>Agriculture Technology</u>	x						x						
<u>Farm Management</u>			x										
<u>Fisheries</u>								x					
<u>Floristry</u>								x					
<u>Horticulture</u>				x				x					
<u>Landscaping</u>						x			x				x
<u>Livestock Technology</u>					x								
<u>Outdoor Recreation Conservation</u>													x
<u>Range Ranch Management</u>													x
<u>Seed Technology</u>								x					
<u>Turf Management</u>								x					
<u>Horseshoeing</u>										x			

Cluster	Blue Mountain	Central Oregon	Chemeketa	Clackamas	Clatsop	Lane	Linn-Benton	Mt. Hood	Portland	Rogue	Southwestern	Treasure Valley	Umpqua
<u>FORESTRY</u>													
Business Forestry					x								
Forest Products Technology			x										
Forestry Technology		x	x		x	x		x			x		x
Range-Forestry Technology												x	
<u>HEALTH OCCUPATIONS</u>													
Dental Assistant	x		x			x	x		x				
Dental Hygienist						x			x				
Dental Technician									x				
Funeral Service Education								x					
Inhalation Therapy Technician						x		x				x	
Laboratory Assistant									x				
Medical Assistant			x	x		x							
Medical Laboratory Technician								x					
Medical Records Technician									x				
Nursing Assistant			x	x	x	x	x						
Occupational Therapy Assistant								x					
Operating Room Technician								x					
Physical Therapy Assistant								x					
Practical Nursing	x	x	x	x		x		x	x		x	x	x
Technical Nursing (ADN)			x			x	x		x				
X-Ray Technology									x				

Cluster	Blue Mountain	Central Oregon	Chemeketa	Clackamas	Clatsop	Lane	Linn-Benton	Mt. Hood	Portland	Rogue	Southwestern	Treasure Valley	Umpqua
<u>HOME ECONOMICS</u>													
Child Care				x		x			x				
Commercial Food Preparation									x	x			
Food Processing Technology								x					
Food Service						x			x				
Home Economics					x								
Homemaking Art									x				
Homemaking Business									x				
<u>OFFICE OCCUPATIONS</u>													
<u>Accounting</u>													
Accounting/General Business	x	x	x	x	x	x	x	x	x	x	x	x	x
Bookkeeping/Clerical				x		x	x						
<u>Data Processing</u>													
Data Processing		x	x	x	x	x	x		x		x		x
Key Punch				x							x		
<u>Clerical</u>													
Business and Commerce					x								
Clerk/Typist						x		x		x		x	
General Office	x	x	x	x			x	x	x		x	x	x
Medical Receptionist								x					
Office Management												x	

Cluster	Blue Mountain	Central Oregon	Chemeketa	Clackamas	Clatsop	Lane	Linn-Benton	Mt. Hood	Portland	Rogue	Southwestern	Treasure Valley	Umpqua
<u>OFFICE OCCUPATIONS (cont.)</u>													
<u>Secretarial</u>													
<u>Business Machines Technology</u>		x											
<u>Legal Secretarial</u>									x		x		
<u>Medical Secretarial</u>				x				x	x		x		
<u>Secretarial</u>	x	x	x	x	x	x	x	x	x	x	x	x	x
<u>MARINE TECHNOLOGY</u>													
<u>Commercial Fisheries</u>						x							
<u>Marine Technology</u>						x							
<u>Oceanography</u>						x							
<u>MARKETING/MANAGEMENT</u>													
<u>Agriculture Business</u>													x
<u>Automotive Parts Mgt.</u>				x				x					x
<u>Banking and Finance</u>								x					
<u>Business Forestry</u>				x									
<u>Business Mid-Management</u>		x	x	x	x	x	x	x	x		x	x	
<u>Commercial Art</u>									x				x
<u>Fashion Merchandising</u>				x									
<u>Insurance</u>						x							
<u>Journalism Technology</u>						x		x					

Cluster	Blue Mountain	Central Oregon	Chemeheta	Clackamas	Clatsop	Lane	Linn-Benton	Mt. Hood	Portland	Rogue	Southwestern	Treasure Valley	Umpqua
<u>MARKETING/MANAGEMENT (cont.)</u>													
Merchandising (Pilot-Business)									x				
Radio Broadcasting	x					x		x	x				
Real Estate Technology			x					x	x		x	x	x
Real Property Appraisal									x				
Sales and Marketing						x							
Television Broadcasting						x		x	x				
Transportation and Distribution								x	x				
<u>SERVICE OCCUPATIONS</u>													
Air Traffic Management								x					
Cosmetology								x					
Criminal Justice Corrections				x									
Educational Aide				x									
Fire Protection (Science)		x	x		x	x	x		x	x			x
Funeral Services								x					
Hotel/Motel Management									x				
Institution Management									x				
Instructional Materials Aide									x				
Law Enforcement	x		x	x	x	x	x		x		x	x	x
Legal Aide												x	
Library Aide/Assistant				x								x	
Physical Education Recreation Asst.								x					
Recreation Management Tech.		x											

Cluster	Blue Mountain	Central Oregon	Chemeketa	Clackamas	Clatsop	Lane	Linn-Benton	Mt. Hood	Portland	Rogue	Southwestern	Treasure Valley	Umpqua
<u>TECHNICAL</u>													
<u>Air</u>													
<u>Air Transportation Technology</u>	x												
<u>Airplane and Powerplant Mechanics</u>								x	x				
<u>Aviation Maintenance</u>	x					x							
<u>Aviation Technology</u>											x		
<u>Flight Technology</u>						x							
<u>Pilot - Air Traffic</u>								x					
<u>Pilot - Business</u>													
<u>Pilot - Electrician</u>								x					
<u>Pilot Training</u>	x			x								x	
<u>Engineering Technology</u>													
<u>Civil Engineering</u>	x		x		x	x		x	x		x		x
<u>Drafting</u>	x		x		x	x	x		x			x	x
<u>Electronic Engineering</u>	x	x	x			x			x				
<u>Highway</u>			x							x			
<u>Mechanical Engineering</u>			x						x				
<u>Structural Engineering</u>			x			x					x		x
<u>Surveying</u>			x										
<u>Environmental Technology</u>													
<u>Environmental Technology</u>				x		x	x						
<u>Water and Waste Water Tech.</u>				x		x	x						
<u>Water and Waste Water Treatment Plant Operator</u>				x		x							
<u>Well Drilling</u>			x										

Cluster	Blue Mountain	Central Oregon	Chemeketa	Clackamas	Clatsop	Lane	Linn-Benton	Mt. Hood	Portland	Rogue	Southwestern	Treasure Valley	Umpqua
<u>TECHNICAL (cont.)</u>													
<u>Supervision</u>													
Supervision							x	x	x		x		
<u>Technical, Other</u>													
Graphic Arts				x					x				
Machine Drafting and Design Tech.				x				x					
Office Machine Repair		x						x					
<u>TRADES AND INDUSTRY</u>													
<u>Construction</u>													
Architectural and Structural Tech.								x					
Architectural Drafting									x				
Construction Technology						x						x	
<u>Electrical</u>													
Electronics Service Technician						x							
Electronics Technology			x	x	x			x			x		
(Pilot - Electronics)								x					
Radio and TV Engineering Tech.								x					
Refrigeration (Appliances)						x							
Television and Radio Service			x			x		x	x				
Video Technology				x									

Cluster	Blue Mountain	Central Oregon	Chemeketa	Clackamas	Clatsop	Lane	Linn-Benton	Mt. Hood	Portland	Rogue	Southwestern	Treasure Valley	Umpqua
<u>TRADES AND INDUSTRY (cont.)</u>													
<u>Mechanical</u>													
Auto Mechanics	x	x		x	x	x	x	x	x	x	x	x	x
Auto Service Station Specialist				x									
Body and Fender	x	x		x		x	x		x				
Diesel	x					x			x				
Foreign Auto Mechanics								x					
Industrial Mechanics			x	x	x		x				x		
Mechanical Technology	x											x	
Power Plant Mechanics									x				
<u>Metals</u>													
Machine Shop Technology			x	x		x		x	x				
Metallurgical							x						
<u>Welding</u>													
Welding	x	x	x	x	x	x	x	x	x	x	x	x	x



OREGON BOARD OF EDUCATION

942 LANCASTER DRIVE NE. • SALEM, OREGON • 97310 • Phone (503) 378-3569

TOM McCALL
GOVERNOR

February 22, 1972

BOARD OF EDUCATION

DR. ELEANOR BEARD
1580 S. Skyland Drive
Lake Oswego 97034

RICHARD F. DEICH
1010 Corbett Building
Portland 97204

EUGENE H. FISHER
Kellogg Route, Box 91
Oakland 97462

W. WARREN MAXWELL
Route 2, Box 30
Lakeview 97630

FRANCIS I. SMITH
600 Morgan Park Building
Portland 97205

FRANK J. VAN DYKE
110 E. Sixth
Medford 97501

FRANK M. WARREN
621 SW Alder
Portland 97205

DALE PARNELL
Superintendent and Executive
Officer of the Board

DON EGGE
Deputy Superintendent and
Secretary of the Board

Mr. Crayton B. Daly
Oregon Board of Education
942 Lancaster Drive NE.
Salem, Oregon 97310

Dear Mr. Daly:

Your request for the privilege of visiting the community colleges in the State of Oregon for the purpose of developing a projection model assessing the need for full-time instructors of occupational subjects is indeed granted from this office.

The Oregon Board of Education is keenly interested in the nature and meaning of issues affecting the community colleges, especially at a time when the community colleges are growing so rapidly. We recognize that little is objectively known about what the supply and demand is pertaining to the type of instructors designated in your request. Your effort will aid our office enormously in that it will identify and magnify an area of great concern not only to our office, but to the community college administrative personnel as well.

This office, to assure professional validity to your much-needed study, is ready to assist and cooperate with you, just as the persons of the individual institutions with whom you plan to visit will do.

Cordially,

Redacted for Privacy

Carrol deBroekert
Associate Superintendent
Instructional Services

CdB:sr

DIRECTORY OF COMMUNITY COLLEGES IN OREGON

<u>Institution and Location</u>	<u>Occupational Director</u>
Blue Mountain Com. College 2410 Northwest Garden Ave. Box 100, Pendleton 97801	Mr. Robert Hawk Dean of Applied Science
Central Oregon Com. College College Way Bend 97701	Mr. Allen Ehl Assistant Dean of Vocational- Technical Education
Chemeketa Com. College 4389 Satter Dr., N. E. Salem 97303	Mr. Alvin Leach Director of Occupational Education
Clackamas Com. College 19600 S. Molalla Ave. Oregon City 97045	Dr. Ronald Kaiser Dean of Occupational Education
Clatsop Com. College Sixteenth and Jerome Astoria 97103	Dr. Jackson B. Hargis Assistant Dean of Instruction and Director of Vocational- Technical Education
Lane Community College 4000 East 30th Ave. Eugene 97405	Dr. Ramon LaGrandeur Associate Dean of Instruction
Linn-Benton Com. College Post Office Box 249 Albany 97321	Mr. William Jordon Coordinator for Special Voca- tional Activities
Mt. Hood Com. College 26000 Southeast Stark Gresham 97030	Dr. Jack Miller Dean of Occupational Studies
Portland Com. College 12000 S. W. 49th Ave. Portland 97219	Mr. Robert Zertanna Dean of Math, Science, and Related Technology
Rogue Community College 3345 Redwood Highway Grants Pass 97526	Mr. Glen Neilson Dean of Instruction

Institution and LocationOccupational Director

Southwestern Oregon Com. College Box 518 Empire Station Coos Bay 97420	Mr. James Piercey Dean of Vocational-Technical Education and Assistant Dean of Instruction
Treasure Valley Com. College 650 College Boulevard Ontario 97914	Mr. Earl McCollum Associate Dean and Dean of Vocational-Technical Education
Umpqua Community College Box 967 Roseburg 97470	Mr. Robert Moldenhauer Dean of Vocational-Technical Education

All of the above-listed institutions
are administered by community
college district boards as provided
in ORS Chapter 341 as amended.

Oregon Com. College Association 685 Cottage Street, N. E. Salem 97301 Phone: 378-6000	Dr. Donald K. Shelton Executive Secretary
--	--

APPENDIX C

Statistical Analysis of Data

STATISTICAL ANALYSIS OF DATA

I. Correlation between 1971-72 and 1976-77 estimates.

Occupational clusters	R1	R2	D	D ²
Office Occupations	1	1	0	0
Trades and Industry	2	2	0	0
Health Occupations	3	4	-1	1
Marketing/Management	4	5	-1	1
Technical Occupations	5.5	3	2.5	6.25
Agriculture	5.5	9	-3.5	12.25
Service Occupations	6	6	0	0
Home Economics	7	7	0	0
Forestry	8	8	0	0
Marine Technology	9	10	-1	1

$$\text{Sum } D^2 = 21.50 \quad N = 10 \quad N^2 = 100 \quad N(N^2 - 1) = 990$$

$$df = (N - 2) = 8$$

$$\rho = 1 - [6(\text{Sum } D^2) / N(N^2 - 1)] = 1 - (129/990) = 0.86$$

Significant at about .01 level in a two-tailed test.

Note: Since this study is basically a projection model (see title), more computation procedure is included (Appendix F) in order to better facilitate the use of a desk calculator for analysis of the data.

II. Test of significance between mean estimates.

Occupational clusters	1971-72		Instructor need $(x-\bar{X})^2$	1976-77		Estimates $(y-\bar{Y})^2$
	x	$x-\bar{X}$		y	$y-\bar{Y}$	
Office Occupations	27	17.3	299.29	56.68	28.20	795.2400
Trades and Industry	16	6.3	39.69	54.02	25.54	652.2916
Health Occupations	12	2.3	5.29	42.23	13.75	189.2625
Marketing/Management	11	1.3	1.69	31.33	2.85	8.1225
Technical Occupations	7	-2.7	7.29	45.16	16.68	278.2224
Agriculture	7	-2.7	7.29	11.35	17.13	293.4369
Service Occupations	6	-3.7	13.69	17.98	10.50	110.2500
Home Economics	5	-4.7	22.09	12.18	16.30	265.5690
Forestry	4	-5.7	32.49	11.66	16.82	282.9124
Marine Technology	2	-7.7	59.29	2.18	26.30	692.6900
Totals	97	54.4	488.10	284.77	174.04	3567.9973

(Continued on next page)

$$N1 = 10 \quad \text{Sum } x = 97 \quad \bar{x} = 97/10 = 9.7$$

$$N2 = 10 \quad \text{Sum } y = 284.77 \quad \bar{y} = 284.77/10 = 28.48$$

$$\text{Sum } (x - \bar{X})^2 = 488.10 \quad Sx^2 = \frac{\text{Sum } (x - \bar{X})^2}{N - 1} = \frac{488.10}{9} = 54.23$$

$$F = 396.31/54.23 = 7.31.$$

There is a significant difference in variability between the two distributions.

Since the two distributions are not homogeneous, the Cochran and Cox method is used.

The standard error of the difference between the two means is:

$$\begin{aligned} *S_{x-y} &= \sqrt{\text{Sum } (x - \underline{y})^2 / N1 \quad (n1 - 1) + \text{Sum } (y - \underline{Y})^2 / N2 (N2 - 1)} \\ &= \sqrt{Sx^2 + Sy^2} = \sqrt{5.42 + 39.64} = \sqrt{45.06} \\ &= 6.71 \end{aligned}$$

The t-value is:

$$\begin{aligned} t &= \frac{\bar{Y} - \bar{X}}{S_{x-y}} = \frac{28.48 - 9.7}{6.71} = 18.78/6.71 \\ t &= 2.79 \end{aligned}$$

The number of degrees of freedom is (Welch):

$$df = [a / (b + c)] - 2$$

where

$$a = (Sx^2 + Sy^2)^2 = 202986.29$$

and

$$b = (Sx^2)^2 / (N1 - 1) = 327.9$$

$$c = (Sy^2)^2 / (N2 - 1) = 17426.85$$

$$df = 9.43 = 9$$

The t-value for df = 9 is 3.250 at 0.01 level.

There is evidence to assure a significant difference between the two mean estimates at less than 0.01 level in a two-tailed test.

* $Sx^2 = (S\bar{x})^2 / S\bar{y}^2 = S\bar{y}^2$. This change in symbolization is done to avoid confusing this factor with a negative exponent such as Sx^{-2} .

APPENDIX D

Discrimination of Pooled Clusters of Occupational Programs

DISCRIMINATION OF COMBINED CLUSTERS OF
OCCUPATIONAL EDUCATION PROGRAMS

<u>Occupational Education Programs</u>	<u>Instructor Estimates</u>		
	<u>1971-72</u>	<u>1976-77</u>	
Agriculture Equipment	0	1.33	
Agriculture Technology	0	2.17	
Farm Management	1	1.17	
Floristry	1	0.84	
Horticulture	2	1.00	
Landscaping	1	2.67	
Livestock Technology	0	0.67	
Seed Technology	0	0.67	
Turf Management	0	0.67	
Horseshoeing	2	0.15	
AGRICULTURE	Totals	7	11.35
Business Forestry	0	0.67	
Forest Products Technology	3	4.16	
Forest Technology	1	5.33	
Range-Forestry Technology	0	1.50	
FORESTRY	Totals	4	11.66
Dental Assistant	2	3.16	
Dental Hygienist	0	1.50	
Dental Technician	0	.84	
Funeral Service Education	0	1.33	
Medical Assistant	0	1.00	
Medical Laboratory Technician	1	1.50	
Medical Records Technician	1	2.00	
Nursing Assistant	1	1.50	
Occupational Therapy Assistant	0	0.67	
Operating Room Technician	1		
Physical Therapy Assistant	2	0.84	
Practical Nursing	4	10.50	
Technical Nursing (ADN)	0	1.84	
X-Ray Technology	0	0.16	
HEALTH OCCUPATIONS	Totals	12	42.23

<u>Occupational Education Programs</u>	<u>Instructor Estimates</u>		
	<u>1971-72</u>	<u>1976-77</u>	
Child Care	0	3.33	
Commercial Food Preparation	3	2.84	
Food Processing Technology	0	0.67	
Food Service	1	0.67	
Home Economics	1	3.50	
Homemaking Art	0	0.33	
Homemaking Business	0	0.84	
HOME ECONOMICS	Totals	5	12.18
Accounting/General Business	6	16.50	
Bookkeeping/Clerical	0	1.50	
Data Processing	6	11.67	
Key Punch	2	2.00	
Business and Commerce	0	0.67	
Clerk/Typist	1	2.16	
General Office	5	9.50	
Medical Receptionist	0	0.67	
Business Machines Technology	1	1.84	
Legal Secretarial	0	1.50	
Medical Secretarial	0	2.00	
Secretarial	6	8.67	
OFFICE OCCUPATIONS	Totals	27	56.68
Commercial Fisheries	0	0.67	
Marine Technology	1	0.84	
Oceanography	1	0.67	
MARINE TECHNOLOGY	Totals	2	2.18
Automotive Parts Management	1	0.84	
Banking and Finance	1	0.16	
Business Mid-Management	3	9.67	
Commercial Art	0	1.84	
Fashion Merchandising	0	0.67	
Journalism Technology	0	0.67	
Merchandising (Pilot-Business)	0	0.16	
Radio Broadcasting	1	4.67	
Real Estate Technology	3	4.33	
Real Property Appraisal	0	0.16	
Sales and Marketing	0	0.67	
Television Broadcasting	2	2.16	
Transportation and Distribution	0	5.33	
MARKETING/MANAGEMENT	Totals	11	31.33

<u>Occupational Education Programs</u>	<u>Instructor Estimates</u>		
	<u>1971-72</u>	<u>1976-77</u>	
Air Traffic Management	0	0.67	
Cosmetology	0	0.67	
Criminal Justice Corrections	0	0.16	
Educational Aide	0	1.16	
Fire Protection (Science)	2	2.84	
Funeral Services	0	0.67	
Hotel/Motel Management	0	1.16	
Institution Management	0	0.16	
Instructional Materials Aide	0	1.16	
Law Enforcement	4	8.50	
Legal Aide	0	0.16	
Physical Education Recreation Assistant	0	0.67	
SERVICE OCCUPATIONS	Totals	6	17.98
Air Transportation Technology	0	0.16	
Airplane and Powerplant Mechanics	0	3.50	
Aviation Maintenance	0	1.50	
Pilot-Electrician	0	0.67	
Pilot Training	0	0.84	
Civil Engineering	1	6.67	
Drafting	1	5.67	
Electronic Engineering	1	6.16	
Highway	1	0.67	
Mechanical Engineering	0	4.00	
Structural Engineering	0	1.16	
Environmental Technology	0	2.16	
Water and Waste Water Technology	0	1.50	
Water and Waste Water Treatment Plant Operator	0	0.84	
Well Drilling	0	1.00	
Supervision	1	3.50	
Graphic Arts	0	3.16	
Machine Drafting and Design Technology	0	0.67	
Office Machine Repair	2	1.33	
TECHNICAL	Totals	7	45.16
Architectural Drafting	1	2.16	
Construction Technology	0	0.84	
Electronics Technology	1	3.84	
Pilot-Electronics	0	0.16	
Radio and TV Engineering Technology	0	1.16	
Television and Radio Service	0	1.67	
Auto Mechanics	6	14.67	

<u>Occupational Education Programs</u>	<u>Instructor Estimates</u>	
	<u>1971-72</u>	<u>1976-77</u>
Auto Service Station Specialist	0	1.50
Body and Fender	1	3.50
Diesel	1	2.84
Industrial Mechanics	2	3.67
Mechanical Technology	0	1.00
Machine Shop Technology	1	3.67
Metallurgical	0	0.67
Welding	3	12.67
TRADES AND INDUSTRY	Totals	16
		54.02

APPENDIX E

Rationale for Averaging the Three Instructor
Estimates for the 1976-77 School Year

RATIONALE FOR AVERAGING THE THREE INSTRUCTOR
NEED ESTIMATES REQUESTED FOR THE
1976-77 SCHOOL YEAR

It would have been easier to simplify the instrument used in this study by requesting a single educated guess as to the estimate of instructor needs for each occupational program during the 1976-77 school year. However, the assumption was made that human factors could introduce errors, and it was necessary to search for an empirical method that would give a more accurate estimation. The instructor estimates were analyzed and compared with existing established statistical distributions (68). Three basic properties were determined from such analysis: (1) It is unimodal; (2) It is continuous; and (3) It has two non-negative abscissa intercepts. The probability that the real instructor need for a program will be within some small interval around some intermediate value is greater than the probability in a similar interval around some other point. Regardless of the shape of the distribution, it will always be continuous, because there will be no zero or infinite estimate within a realistic interval. Finally, there will be no negative instructor estimation.

The Beta distribution, which has been used as a model to reflect the uncertainty factor in time estimates for activity completion in Program Evaluation and Review Techniques (PERT), was found to resemble the distribution of instructor estimates. The probability density function of the Beta distribution is:

$$f(t) = K (t-a)^\alpha (b-t)^\beta$$

where (a) and (b) are the two extreme estimates, K, α , and β are functions of (a) and (b). A third estimate (m) is defined as the most likely, and the mode of the distribution. This function can be reduced through variable change to the standard form of the Beta distribution; and from there, the parameters could be calculated through the solution of a cubic equation.

A linear approximation can be obtained by using the formula:

$$te - 1/6 [(a + 4m + b)]$$

where (te) is the average teacher estimate computed from the three requested educated guesses.

APPENDIX F

Additional Computation Procedures for Analysis of Data

ADDITIONAL COMPUTATION PROCEDURES
FOR ANALYSIS OF DATA

I. Correlation between 1971-72 and 1976-77 estimates

$$\text{Sum } D^2 = 21.50$$

$$N = 10$$

$$N^2 = 100$$

$$\Sigma (N^2 - 1) = 990$$

$$\rho = 1 - \frac{6 \Sigma D^2}{N(N^2 - 1)}$$

$$= 1 - \frac{6(21.50)}{990}$$

$$= 1 - \frac{129}{990}$$

$$= 1 - (0.13)$$

$$\rho = 0.86$$

II. Test of significance between mean estimates

This computation completely performed in original analysis, no additional computation analysis necessary.

III. Standard error of the difference between means (Cochran and Cox Method)

This computation completely performed in original analysis, no additional computation necessary.

Degrees of freedom (Welch Method)

$$df = [a/(b + c)] - 2$$

Basic Formula

$$\begin{aligned} a &= (s_x^2 + s_y^2)^2 \\ &= (54.23 + 396.31)^2 \\ &= (450.54)^2 \end{aligned}$$

$$a = 202986.29$$

$$\begin{aligned} b &= (S_x^2)^2 / (N_1 - 1) \\ &= (54.23)^2 / (9) \\ &= 2951/9 \end{aligned}$$

$$= 327.9$$

$$\begin{aligned} c &= (S_y^2)^2 / (N_2 - 1) \\ &= (396.31)^2 / (9) \\ &= 156881.62/9 \end{aligned}$$

$$c = 17426.85$$

$$df = [202986.29 / (327.9 + 17426.85)]$$

round off decimals

$$= (202986 / 17755) - 2$$

$$= (11.43) - 2$$

$$df = 9.43$$

Table of Percentage Points of the t-Distribution

$$df = 9 \text{ down, } 0.010 \text{ across top} = 3.250$$