AN ABSTRACT OF THE THESIS OF

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TITLE: THE APPLICATION OF BLOOM'S TAXONOMY TO PROFESSIONAL EDUCATION COMPETENCIES OF SELECTED VOCATIONAL INSTRUCTORS

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The Purpose of the Study

The primary purpose of this study was to assist in the structuring of an empirically based vocational teacher preparatory program by determining the hierarchical levels of common professional education competencies needed by community college and secondary school vocational instructors. Several dimensions were considered: personal administration of the test instrument to selected vocational instructors, the application of factor analysis to the professional education competencies and other analyses of data to determine differences in the independence of the two groups, and the formation of behavioral implications to be considered in the development of vocational teacher preparatory curriculum.

The Procedures

The instructor questionnaire used in the study was a survey-type modified for personal administration to respondents, and field tested for validation and practice of application. Prior to the administration

of the instrument, a review of Bloom's cognitive taxonomy and its relationship to the study was conducted with each respondent.

Contained within the instrument were 99 professional education competencies in combination with a six point ordinal scale corresponding to the major classifications of Bloom's cognitive taxonomy. Respondents judgmentally assigned the dependent variable to indicate the hierarchical level they considered necessary to accomplish the task in each of the 99 competencies.

Respondents typically represented the specialized instructional areas associated with vocational education programs. The study's sample population was drawn from Oregon's 12 community colleges and 13 randomly selected secondary schools. Using a four factor criteria of teacher effectiveness, school administrators recommended respondents for participation in the study. Data were provided by 47 vocational instructors in each group, for a total of 94 respondents in the selected sample.

The Data

The Median Test was used to conduct 99 two-way classification analyses to determine whether the two independent groups differed significantly in central tendencies, and whether they were drawn from populations with the same median.

Further examination of the data was provided for by the use of two factor analysis techniques known as the Q-Mode and R-Mode. The Q-Mode technique ordered respondents according to the 99 competencies in the study. The R-Mode technique clustered competencies according to the

respondents in the study. Primary factors and subfactors were judgmentally determined after the data were analyzed.

Findings

Except in two instances, values generated by the Median Test indicated no significant differences existed between the study groups. The Q-Mode analysis further revealed that community college and secondary school respondents were alike in their responses to the competencies contained in the study. Competencies were clustered under four primary factors and three subfactors. As indicated by the Quantile Distribution of the Domain Levels (Medians), approximately 80 percent of the respondents judged the hierarchical levels of the competencies in the study to be at the Application level and higher. Competencies clustered under Factor II, Instructional Process, and Factor IV, Preparation for Instruction, were judged by the respondents to have the highest Domain Levels.

The Application of Bloom's Taxonomy to Professional Education Competencies of Selected Vocational Instructors

by

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CHAPTER I

INTRODUCTION

Background of the Problem

Historically, men have always had to cope with the problems of change. However, the acceleration of modern technology may be causing change at a pace faster than man and his social structure can adequately prepare. Change is not only causing our national attention to focus on the way we live, but also on how we make and prepare for our livelihood. As reported to the President of the United States in the General Report of the Advisory Council on Vocational Education 1968, the impact of these changes reflect directly on public education and has magnified the relationship and interdependency of work and education. The Report recognizes that "An occupation is the most occupying of all human activities. . . . having caused vocational education to become central to the total process of public education" (p. xix). Solutions to the problems of change, continues the Report, may require radical adjustments in the educational process and a significant departure from previously established goals and techniques.

The commitment of the nation to meet its social and economic imperatives is specifically detailed in recent federal legislation which has been adopted and implemented by each of the fifty states. The most difficult of tasks is the development of teacher preparatory and

local vocational programs which will provide the necessary "liberalizing forces" to generate the flexibility needed to fit the educational, occupational, and social requirements of the individual.

Further recognizing the crucial forces affecting society and its schools, the American Association of Colleges for Teacher Education (1971) asserts that it must take a dynamic position and accept a major responsibility for the improvement of teacher education programs. The following is first on its list of urgent problems confronting society and its member institutions, and germane to the underlying rationale of this study.

> The affecting of curriculum and instruction changes, at both undergraduate and graduate levels, which adequately reflect the societal needs and realities with which schools and teachers should be concerned. The system of curriculum change in most colleges and universities is extremely cumbersome, a system clearly designed to maintain tight controls over programs. The rapidity of contemporary social change demands, however, that curriculum change be facilitated, rather than retarded, if colleges and universities are to remain relevant to the world of which they are a part. Continuous curriculum experimentation must replace the typical pattern in most institutions of unchanging programs lasting beyond their usefulness, finally supplanted by untested alternatives (p. 4).

Prior findings of the General Report of the Advisory Council on Vocational Education 1968 fully support the AACTE's position on the necessity for curricular change, since

> . . . differences have developed in the area of professional education for teachers in such a way as to result in characteristics distinguished by the program for vocational education teachers from those for teachers of other subject matter areas (p. 123).

Moving towards the goal of improving vocational teacher preparation curricula, Oregon State University and the Oregon Board of Education are actively supporting and encouraging preparatory programs emphasizing

the development of professional behavioral (terminal) objectives in undergraduate and graduate studies, supplemented by qualifying internships in the field.

Statement of the Problem

The studies of Gunderson (1971), Lindahl (1971), and Miller (1971) re-emphasized the emerging concepts of the Division of Vocational, Adult, and Community College Education for the preparation of vocational educators at all levels, and were designed to facilitate the process of developing vocational teacher preparation curricula. The accent of these studies reflect the need for flexibility in teacher education programs proposed by Dillon (1969), as well as the necessity to identify the unique aspects of each area of vocational education, and what is common to two or more areas.

As distinctive as these steps are to the identification of common professional education competencies, the importance of developing a hierarchical framework within these tasks cannot be minimized. The function and relationship of the hierarchical structure in educational behavior is explained by Krathwohl (1965) as follows:

> The taxonomic approach makes its greatest contribution in forcing the instructor to spell out his instructional goals in terms of overt behavior. . . .Thus, the instructor knows what kinds of behavior (levels) he is trying to develop in the classroom (p. 84).

Acknowledging the necessity of restructuring its teacher education programs to parallel evolving national and state needs, the Division of Vocational, Adult, and Community College Education, Oregon State University, has described an innovative approach to the problems of vocational teacher

curriculum development in its Proposal For Change (1970). The proposal stresses the need to identify common elements of required behavioral competencies, and urges,

> Oregon State University should take the leadership in building an empirically based training program which is validly related to those tasks with which the beginning teacher will find himself confronted in the field (p. 4).

To assist in the structuring of an empirically based vocational teacher preparatory program, the central problem of this study was to determine the hierarchical levels of common professional education competencies needed by community college and secondary school vocational instructors. Data collected from selected vocational instructors in Oregon established the basis for suggesting curriculum relevant to vocational teacher education programs.

The problem contains two major dimensions:

1. The quantitative analysis of data gathered from effective vocational instructors to establish a suggested hierarchical structure of common professional competencies.[1]

2. Behavioral implications from the data as they relate to the development of curriculum content for vocational teacher preparation, performance objectives, and teacher strategies for the preparation of community college and secondary school vocational instructors.

Assumptions of the Study

Recent research by Allen (1968), Arnold (1965), Crawford (1969), and Smith and Moss (1970), provided the rationale for applying a hierarchical structure to the professional tasks of vocational educators, as a means of examining educational experiences which may be included in vocational

[1]Common competencies are those tasks considered as not being specific to any one type of vocational instruction.

teacher preparatory curricula. These and other studies suggest that the taxonomic design would be useful for experimentation and study of curriculum development.

The literature additionally confirms that competency data gathered from the field, when combined with the hierarchical approach, best assists the curriculum planner to understand the relationship of one potential educational objective to another. Bloom (1956) and Gagnè (1965) have established the conceptual basis for this structure by advocating the existence of a hierarchical framework in the learning process, moving in a direction from the simplest to the most complex forms. Therefore, for the purposes of this study, it is assumed that the same principles apply to the matter of task performance; the identification of these tasks, associated with the cognitive taxonomy, will provide a useful device for limiting the "fragmentation" and "atomization" of educational purposes in vocational teacher preparation programs.

In studies examining taxonomic structures, according to Yagi (1968), it is difficult to apply a hypothesis in the classical sense. However, to organize the mechanics of the study and to facilitate planning and organization, it was necessary to construct the following operating premise; The problems of curriculum development for vocational teacher preparation can be better solved through the application of Bloom's cognitive taxonomy to the professional competencies of vocational instructors.

The use of factor analysis as a major statistical tool for examining data with several potential sources of common variance has been found in the literature to be useful for the clustering of tasks. The clustering

capability of factor analysis is applicable to the intent of this study, and has been used extensively in societal and scientific research. The factor analysis approach for the clustering of common professional competencies for vocational educators has been substantiated in education by the work of Courtney (1970), Courtney and Halfin (1969), and Halfin and Courtney (1970). Similar techniques were used for the first time at Oregon State University in educational research by Gunderson (1971), Lindahl (1971), and Miller (1971).

Kerlinger (1964) identifies two basic purposes of factor analysis:

1. to explore variable areas in order to identify the factors presumably underlying the variables as well as the variables

2. to test hypotheses about the relations among variables (p. 680).

Because factor analysis techniques can identify several potential sources of common variance, it was the intent of this study to apply the first basic purpose of factor analysis (i.e., to explore the hierarchical levels of common professional education competencies).

Factor analysis tell us what measures can be studied together rather than separately, and as such, it has great potential in educational research. For the purposes of extracting common factor variances from sets of measures, Kerlinger concludes, ". . . factor analysis is one of the most powerful tools yet devised for the design and analysis of complex areas of scientific psychological and educational concern" (p. 684).

Definitions of Terms

The following definitions are included for purposes of standardizing the use of terms in the study. Other terms or phrases used in the report are considered to be self-explanatory.

Affective Domain	A category of the Taxonomy of Educational Objectives which includes objectives that describe changes in interest, attitudes, values, and the development of appreciations and adequate adjustments. Bloom (1956).
Cognitive Domain	A category of the Taxonomy of Educational Objectives which deals with the recall or recognition of knowledge and the development of intellectual skills. Bloom (1956).
Common Factors	Statistical representations of some ability or trait which two or more items or tests in the battery have in common. Cattell (1952).
Common Variance	The sharing of variance by two or more elements. In such a sharing, the elements are highly correlated and measure some trait in common.
Community College	A two-year public institution of higher education in Oregon with academic, vocational-technical, and general education programs. It is designed to provide a wide-range of options and services in response to the needs of the local community.
Competence	An individual's ability to produce agreed-upon results. Biddle (1964).
Domain Level	One of the sections of the taxonomy.
Educational Objectives	A description of the student behavior which represent the intended outcomes of the educational process, including the behavior the student is to display as well as the subject matter or content to be used in the display. Crawford (1969).
Factor Analysis	Essentially a wholistic method in that it constructs statistically from a host of variables (observations) the important whole which needs to be taken into account when seeking laws of interaction. It gives us the shape of the real structure hidden in the swirling multiplicity of variables. Cattell (1952).

Factor Loading	Correlation of any particular test with the factor being extracted. Cattell (1952).
Factor Matrix	Is the matrix whose entries are the factor loadings obtained from a factor analysis and sometimes referred to as a factor pattern matrix. Cattell (1952).
Factor Solution	Refers to the number of factors the computer program was set to extract.
Hierarchy	An order of terms from the simplest to the most complex, corresponding to some "ideal" order among the phenomena as found in nature.
Job Analysis	A collection and interpretation of information about work performed; describes the job towards which training is directed and to determine the effectiveness of training as reflected in job performance.
Occupational Analysis	Application of a systematic method of obtaining information focused on occupations and industries as well as jobs, tasks, and positions.
Orthogonal (See Rotation)	Two traits that are uncorrelated in a population are considered as orthogonal in that population. Thurston (1947); and are at right angles, perpendicular to an axis. Cattell (1952).
Q-Mode	A factor technique which indicates the extent to which respondents are alike or resemble each other with regard to the competencies listed in the Instructor Questionnaire.
R-Mode	A factor analytic technique which examines the relationship of every competency with every other competency, and provides for a clustering of common competencies. This process orders competencies according to respondents.
Rotation	A geometric process which interprets the relationship of traits through a distribution of raw scores along an axis, thereby permitting the most fruitful set of parameters to describe the variation of a domain. Thurston (1947). A process of moving factor axes and their hyperplanes in order to allow more points to fall in these hyperplanes. Cattell (1952).

Secondary School	A public supported institution from grades 9 (or) 10-12 offering academic, vocational, and general education programs awarding the standard high school diploma as prescribed by the Oregon Board of Education.
Specific Factor	A statistical representation of some ability or trait whose factor loadings are greater than $\pm$.450.
Spurious Factor	Competencies whose factor loadings are less than $\pm$.450.
Task	The smallest unit of work that has a meaning within itself; an activity constituting a distinct and necessary part of the work done by an employee. Ertel (1966).
Task Analysis	A process whereby a task is examined, and its characteristics in terms of certain attributes are identified.
Taxonomy	A classification scheme as biological taxonomy is for class, order family, genus, and species. As applied to education, this taxonomy seeks to classify kinds of behavior we seek to have students display. Krathwohl (1964).
Terminal Objectives	Student performance objectives in which the student action is stated at the level of a meaningful performance. Crawford (1969).
Vocational Education	As used in this study it encompasses such terms as occupational education, career education, and technical education, and refers to courses, programs, and related instruction designed to prepare the learner for job entry or advancement in a current job.
Vocational Instructor	An individual who, in completing the Instructor Questionnaire, has identified his primary teaching responsibility to be in one or more of the specialized subject matter areas of vocational education.
Zero Loadings	A factor loading so small that its magnitude is probably due entirely to chance or experimental error. Cattell (1952).

CHAPTER II

REVIEW OF RELATED LITERATURE

Research pertaining to the taxonomy of educational objectives and terminal behaviors has, until recently, been mostly of an exploratory nature. Little research has been published which provides a clear-cut explanation of how the classifying of educational objectives can best fit into curriculum development for professional teacher preparation. This section represents a comprehensive review of literature which suggests that curriculum development is a matter of learning management and learning structure; and that planning precedes an effective educational design in terms of producing and assessing expected behavioral outcomes.

Need for the Study

The writings of Ralph W. Tyler during the 1930's were among the first to describe learning in behavioral terms, and to recognize the need for specificity in curriculum development. Since his earlier studies, Tyler has continually re-emphasized the importance of these characteristics in curriculum development. Tyler considers the learner as an "active and purposeful human being;" therefore, curriculum becomes more than a mere vehicle to transmit information. The real function of the curriculum, says Tyler (1966), is

> . . . to help the student perceive and use a generalized mode of behavior, as shown by his ability to deal appropriately with the specific subsumed under the generalization (p. 26).

He lists certain conditions as necessary for effective teaching, two of which have been noted as important to the implications of this research.

1. Each learner (must) set standards for himself that require him to go beyond his performance, but standards that are available.

2. To continue long beyond the time when a teacher is available, the learner must have means of judging his performance, to be able to tell how well he is doing. Without these means, his standards are of no utility (p. 27).

Instructional objectives, observes Tyler (1950), must express themselves in terms which identify both the level of behavior to be developed, and the content or area of life in which this behavior is to operate. Tyler criticizes the lack of objectivity in instructional programs by commenting,

> Statements of what the instructor will do are not really statements of educational ends, since the real purpose of education is not to have the instructor perform certain activities, but to bring about significant changes in the student's patterns of behavior. . . . Any statements of objectives of the school should be a statement of changes to take place in the student. Given such a statement, it is then possible to infer the kinds of activities the instructor might carry on in an effort to obtain the objectives (p. 28).

When describing the role of student-teacher interaction in the instructional process, Flanders (1970) reinforces Tyler's observations of the learner as an active and purposeful human being. Flander's study has shown that during instruction the student as well as the teacher forms his own opinions on goal perceptions and levels of acceptable competency. Unfortunately, under the conditions of "instructional goal ambiguity", when the teacher does not clearly define expected levels of terminal behavior, the student often misdirects his efforts, resulting in an adverse effect on the final outcome. However, it is reasonable to expect a more acceptable change in the student's behavior and goal perception when the instructional objectives are clearly stated, suggests Flanders.

The problem of instructional objectives is related directly by Biddle (1964) to the question of teacher effectiveness and professional competence. Therefore, to understand the full scope of teacher effectiveness, it is necessary to establish the instructional atmosphere or working relationship between what the teacher does, and the observed behavioral outcomes exhibited by the student. In this context, Biddle defines professional competence as ". . . an individual's ability to produce agreed-upon results" (p. 2).

Questions of teacher effectiveness are also raised by Noll (1957) from the viewpoint of objective measurement and evaluation of behavioral outcomes. Specifically stated educational objectives and goals are considered by Noll as the most logical rationale against which instructional effectiveness can be measured. Noll reasons that prior to the determination of teacher effectiveness, one must know what the teacher is attempting to accomplish in the classroom. He expands on the relationship between teaching and competency by noting,

> When objectives are poorly defined or perhaps not defined at all, it is impossible to do an effective job of evaluation (or teaching). . . . Objectives and measurements complement each other, and are an integral part of the whole (p. 91).

Mager (1962) supports the findings of Noll by suggesting that instructional success and goal attainment are related, achievement being dependent upon the series of objectives set for a course or program. Goal setting is the first and uppermost responsibility of an instructor when he decides to teach a course. The course objectives become the "intent" of what the learner is to be like when he successfully completes the instruction.

Mager (1967) recognizes that personal qualities of a teacher are essential to encouraging student learning and creativity. However, to be effective in the area of goal attainment, the instructor must be able to define,

> . . . what kinds of things the student should be able to do at the end of the course that will most facilitate his becoming a skilled (teacher) in the least amount of time (p. 29).

Although not disagreeing that being able to state behavioral objective is a necessary competency for an effective instructional design, Moore (1969) believes additional attention needs to be given to those factors which make an effective teacher. He views the development of instructional objectives as only the starting point in building professional teaching competencies.

The significant changes that are taking place in the occupational and social needs of the United States indicate that vocational education must continue to make adjustments as it becomes an integral part of the total educational system. According to the General Report of the Advisory Council on Vocational Education 1968, the integration of vocational education ". . . is no longer a debatable issue" (p. xxi). Modern technological advances and the stresses placed upon society and the individual require a flexibility in the educational system not heretofore conceptualized. Because of education's responsibility towards the development of the whole individual, the General Report of the Advisory Council on Vocational Education 1968 continues, ". . . it is incumbent upon all educators to see that a dichotomy between education and vocation does not exist" (p. xxi). Evidence indicates it is not a question of

willingness by the vocational instructor to accept the broadened responsibilities thrust upon him by society and the school, but more a problem of professional preparation and functional adaptability to changing instructional situations, many of which cut across traditional service area lines.

The studies of Albrach (1966), Arnold (1965), Cotrell (1969), and Courtney (1968) suggest a standardization of vocational curriculum development to include a composite or variety of teacher preparation programs. Courtney comments, "Our technological society will require preparation in which emphasis is placed upon a common understanding of principles" (p. 10); with the implications that vocational curriculum development should move towards comprehensiveness, and away from the confines of limited occupational skills. For curriculum planners, Courtney specifies a need to search for elements common to the core of the instructional program, and to study their similarities and differences.

An obvious implication of the previously mentioned studies is a trend towards the clustering of competencies and knowledge, the necessity of which was observed in a study by Rahmlow (1966) investigating employees in child care work. Rahmlow found that ". . . the clustering approach helps to provide individuals with both an informed choice of alternatives and competence to work effectively" (p. 1).

Goodlad (1966) and Tuckman (1969) reveal a similar approach to solving problems of curriculum development through the establishment of a systematic structure which would expose and identify the interrelationships of major common core curricular elements. Problems of curriculum development are seen by Goodlad as essentially a matter of process and construction, and not one of organizing a milieu of specialized information.

DeVore (1966) conceives curriculum development as a matter of structure, and not an accumulation of knowledge. He attributes the function of the curriculum as a medium through which the purposes and objectives of education are implemented and realized. DeVore suggests the structural approach will assist in determining whether there exists certain constants or universals upon which to build stability and adaptability to change. The study questions the necessity to continuously revise the total curriculum, and anticipates establishing a curriculum structure where only certain levels need be adjusted to meet changing instructional requirements. Curriculum development by DeVore's definition,

> is not the creation of knowledge, but rather the structuring and disseminating of knowledge in the technologies for efficient learning and intelligent use (p. 1).

Summarizing the necessity to promote changes in the vocational educator's preparatory curriculum, Cotrell (1966) noted that it is time to critically analyze the skills and knowledge required by vocational teachers to fulfill the national commitment to a changing educational emphasis. Towards the up-grading and improving of teaching effectiveness, Cotrell suggests,

> A logical strategy for increasing the efficiency of teacher education is to determine the various skills and knowledge needed by all vocational-technical teachers, which of these are common across service areas and which are truly unique to a service area (p. 25).

Cotrell's examination of pre-service and in-service requirements of vocational educators disclosed a great diversity of professional requirements through the states. It was found that as occupations became more

complex they tended to become "hybridized", being nothing more than modifications of the same education and training undergone by others.

Contrasting existing vocational teacher certification requirements with the broad educational needs of the United States, Cotrell and Beaumont (1969) emphasized the vocational education amendments of 1968 did not mention professional preparation of vocational educators in terms of the traditional occupational service areas, but rather the sociological and economic needs of all people. As part of the search for new and more effective means to meet our contemporary educational requirements, Cotrell points out that if training of vocational teachers is to meet the needs of all people, the education and training must not be

> . . . that dictated by past traditions of professional educators. If critical needs for more and better trained vocational education teachers are to be met, greater effectiveness and efficiency in the teacher education system must be attained (p. 25).

Professional variations in the preparation of technical personnel for similar jobs were also found by Arnold (1965), who suggests the following cause and remedial direction in training programs:

> Established curricular guidelines in technical education are lacking. The corresponding different philosophies, resources, and internal structures of diverse types of institutions are in many cases providing industry essentially with variations of the same product. Within this varied ideational and organizational framework lies a basic need for recognizing, identifying, and relating the technician's function in industry to the curricula which would best assure them of occupational competence (p. 1).

Similar findings concerning needed improvement in community college teacher preparation have been outlined by the American Association of Junior Colleges survey (1969), LaGrandeur (1968), Gleaser (1968), and Peterson (1965). Peterson, after ranking 85 percent of California's

responses for the most pressing problems confronting that state's junior college programs, found the following four items to be among the highest in the 26 critical areas needing remediation:

1. Effectiveness and improvement of instruction
2. Evaluation of instructional offerings
3. Preparation of instructors
12. Instructor evaluation (p. 26)

Related Studies

The literature has indicated that professional opinions of successful instructors may be of greater value in indicating the direction of needed curriculum change than opinions of those not so recognized. To incorporate this concept into the design of the study, several publications of collected works on teacher effectiveness were examined. It was found that the results of a study by Cosgrove in the Handbook of Research on Teaching, edited by Gage (1963), were useful to this approach. The research procedures used by Cosgrove employed the forced choice technique for the collection of raw data which, by Gage's analysis, largely overcomes the "leniency tendency" of raters. Through the use of factor analysis, Cosgrove identified four specific factors of teacher effectiveness which represent the relative strengths within a teacher rather than denoting professional relationships with other teachers. The factors are as follows:

A. Knowledge and organization of subject matter.
B. Adequacy of relations with students in class.
C. Adequacy of plans and procedures in class.
D. Enthusiasm in working with students (p. 341).

The determination of behavioral objectives can be established by a number of task analysis methods outlined by Wiley (1970). Abstracting from various studies the descriptions of several systems approaches used in curriculum development, Wiley summarizes the three most commonly used in vocational education as task analysis, job analysis, and occupational analysis. Unfortunately, states Wiley, because of an ". . . over-lapping in the application of terms, clear distinctions are difficult to establish" (p. 8). He continues, regardless of the methods used for data collection, for the purposes of greater sophistication, ". . . more emphasis will be directed towards obtaining data from persons closely associated with the occupations, and applying stringent guidelines and decisive rules" (p. 9).

Tuckman (1968) introduces another method which parallels the writing of DeVore and the use of structure analysis for curriculum development. Tuckman considers this method as essential to the organization of behavioral objectives for instructional purposes. Structural analysis is defined by Tuckman as

> an attempt to organize terminal performance objectives . . . into a sequence of prerequisite competencies which must be satisfactorily mastered if successful terminal performance is to occur. The technique involves asking the question: "What competencies must a person already possess in order to obtain a satisfactory performance level on some specified objective . . . (p. 1).

The study implies that a structural approach is essential not only to the identification of the competencies themselves, but the arrangement of competencies in a hierarchical sequence. Once the hierarchy has been established, the curriculum planner can use it as a guide for the preparation of instructional materials and the establishment of terminal objectives.

The sequential order of prerequisite competencies outlined by Tuckman has its foundations in studies by Bloom (1956), and the learning structure of Gagnè (1965). The taxonomy represented by Bloom is a disciplined structure which provides a meaningful relation for effective learning, leading to improved student performance, greater instructional efficiency, and continual reinforcement. Its hierarchical character enables users to more clearly understand the place of a particular objective in relation to another objective. Specific educational objectives, asserts Bloom, provides the basis for building curricula and tests which can be evaluated objectively. Educational objectives, when stated in behavioral terms, can be observed and manipulated in the same manner as the taxonomic descriptions associated with the physical and biological sciences, says Bloom. When educational objectives are stated in precise language, ". . . such behavior can be observed and described, and these descriptive statements can be classified" (p. 5).

Bloom favors the cognitive taxonomy because of its utility in the educational process, since it represents the area in which most curriculum development has taken place and where the clearest definitions of educational objectives are to be found. Briefly, it deals with recall or recognition of knowledge, and the development of intellectual abilities and skills. Bloom's taxonomy is founded upon a learning pattern which moves from the simplest to the most complex forms. The major headings[1] within the taxonomy are as follows: (1) Knowledge, (2) Comprehension, (3) Application, (4) Analysis, (5) Synthesis, and (6) Evaluation. Through

[1]See Appendix B for a complete description.

this structure, states Bloom, the taxonomy facilitates communication and comprehensiveness by precisely defining terms. Such precision enables curriculum planners to better understand learning experiences, and to compare and discuss similarities or differences among educational goals.

Krathwohl's (1964) agreement with the concepts of Bloom is shown in the structuring of the affective domain which also moves from the simplest to the most complex forms of activity. However, unlike the cognitive domain, it is difficult to observe and measure objectively since it assumes an "internalization" or perceptual reaction to external stimuli. The major categories of the affective domain are : (1) Receiving, (2) Responding, (3) Valuing, (4) Organization, and (5) Characterization by Value or Value Complex (internalization).

A number of researchers, such as Williams (1969), are attempting to combine the cognitive and affective domains in curriculum development. Krathwohl (1965) sees the affective domain playing a more important role in learning patterns than the cognitive domain. Williams, describing the relationship of the cognitive and affective domains as applied to encouraging creativity in the classroom cautions, " . . . attempts to bridge cognitive thinking with affective feeling in pupil behaviors or processes have so far been relatively sparse" (p. 4).

Gagnè's (1965) contribution to learning theory constructs six elemental categories similar to those of Bloom and Krathwohl, and have been found by curriculum planners to be useful in curriculum development. For successful problem solving, Gagnè proposes that a person's capability or competency depends upon having mastered a simpler prior knowledge. Moving from the simplest "responses" to the construction of "principles", Gagnè's concept is best illustrated by the following outline:

Principles
which require the pre-learning of:

Concepts
which require the pre-learning of:

Associations
which require the pre-learning of:

Chains
which require the pre-learning of:

Identifications
which require the pre-learning of:

Responses

Several studies have been conducted within the past several years utilizing combinations of taxonomic structures and learning theories.

Crawford's (1969) study used the cognitive taxonomy to determine the critical tasks and competencies needed by distributive education instructors. The study attempted to establish a more scientific basis for the developing of vocational education curricula. Although not using a quantitative design, but rather a committee of consultants, the study developed terminal (expected behavior) objectives in combination with "enabling" (cognitive) objectives. Crawford found that instructional objectives may be structures at varying levels of specificity, depending upon how they are intended to be used. Additionally, instructional objectives should be clearly stated in terms of student behaviors and levels of difficulty if they are to be helpful in specifying the goals of the instructional process.

Simpson's (1966) study of the psychomotor domain suggested that curriculum structures other than taxonomic can be beneficial, but for stating terminal behaviors and individualization of instruction, the taxonomic approach was found to be most useful.

The report of Sjorgen and Sahl (1966) summarizes the related literature to this point. Their examination of vocational curricula indicates that broad educational experience, followed by specific training for a single job was more efficient and effective than vocational curricula designed to teach specific jobs. The following comment describes their findings in greater detail.

> Rather than attempting to define a general vocational curriculum on a rational basis, the more reasonable approach is to define a general vocational curriculum on the basis of observable similarities among jobs in terms of skills, abilities, tasks, and competencies. With such an approach, job clusters would be identified or defined on the basis of each job in the cluster having relatively high commonalities or required skills, tasks, abilities and competencies with other jobs in the cluster. The general vocational course for this job cluster would then be designed to teach the factors common to those jobs in the cluster. The training for specific jobs would follow the general course and would consist primarily of experience designed to teach specific factors not included in the general curriculum. . . . the first step in developing a general course or curriculum, is that of identifying job clusters (p. 4).

Using the clustering techniques of factor analysis, the task analyses studies by Gunderson (1971), Lindahl (1971), and Miller (1971) were the first at Oregon State University especially designed to determine the professional education needs and proficiency requirements of community college instructors in the vocational service areas. Their major objective was to extract a common core of potential subject matter which would be descriptive of professional education needs and instructor-performance elements, and to develop a list of professional education competencies common to community college vocational instructors. Each researcher sampled a total of 40 community colleges and 160 participants in California, Colorado, Oregon, and Washington, and found that no

significant differences existed between the respondents in the four states.

In a paper presented to the 4th annual national vocational-technical teacher education seminar at St. Louis, Missouri, Cotrell (1970) described a 19-state study of 237 performance requirements of vocational teachers, in seven service areas. A comparison made between secondary and post-secondary school teachers concluded that there were very few differences found between the elements important to secondary and post-secondary teachers.

Related Methodological Studies

The use of factor analysis as an analytical tool is common practice in the examination of personnel tasks and employee attitude surveys, and has been used extensively in the scientific fields where variations of individual differences must be identified. As computer programs become readily available, says Kirchner and Likas (1970), the use of factor analysis as a technique for the analysis of interrelationships will also increase. The article points out that factor analysis simplifies confusing data by clustering those items that go together, and from such clustering, one can determine the basic factors present in the study. To achieve valid results through factor analysis, the researcher must use a homogeneous population.

Good (1954) describes factor analysis as ". . . a technique which may be of aid in deciding upon components of a trait" (p. 361). To assist the reader in better understanding factor analysis as a research technique for identifying numerous variables in task behaviors and

curriculum, the following description is provided. Factor analysis is a statistical method which consists essentially of:

> (1) giving a rather large number of tests which are presumed to measure some aspect of the general trait and which will represent a wide range of elements that might enter into the general trait;
>
> (2) calculating intercorrelations among these tests to find those which tend to measure (or be saturated with) the same element or factors;
>
> (3) deducing (mentally) what this trait (factor) is that a particular subgroup of correlated tests is measuring in common, and giving it a name;
>
> (4) repeating this process, by technical statistical means, until a satisfactory number of factors have been distilled out. Ideally these factors will be reasonably few in number (maybe half a dozen) and will, together, account for a large portion of what was measured by the original set of tests. This, then, is the goal of factor analysis, namely, to produce a rather small number of traits (factors, or component elements) which will come reasonably close to covering the same field (the general trait in all its aspects) as a large number of varied tests (p. 362).

Essentially, there are minimal differences in definition and use of factor analysis as described by Cattell (1952), Good and Scates (1954), Harman (1967), and Thurston (1947), who agree that structurally it is a rigid arithmetic tool. Emphasizing the significant difference between factor analysis and the human experimenter's predictive research methodology, Cattell writes,

> By arbitrary choice of variables . . . the experimenter selects on the basis of his own hunches the controlled or uncontrolled variables that will best test the hypothesis he has in mind. . . . factor analysis does not accept arbitrary choices as to what are the important variables. . . . Factor analysis groups the numerous possible variables into the fewest possible single wholes or wholistic influences (p. 10).

When development of curricular structure is considered from the viewpoint of task performance, the use of factor analysis to study professional competencies and behavioral objectives is not unusual. The substantiation of factor analysis in vocational education curriculum development has been evidenced by several national studies.

Courtney and Halfin (1969), utilizing a vocational education training needs instrument, determined the common training requirements of secondary level vocational education teachers through factor analysis of responses from 40 randomly selected vocational educators representing Pennsylvania, Iowa, North Carolina, and New Jersey. The computer program used processed the data through orthogonal rotation, providing information which led them to conclude that commonalities within the five vocational disciplines studied could serve as a common core of training experiences for a broad-based vocational teacher preparatory curriculum.

Halfin and Courtney (1970) identified the common core of curricular experiences for the training of technical teachers. The study utilized a Likert-type instrument, and was administered to 150 teachers randomly selected from each of five vocational disciplines. Ten states were used in the study. The data gathered were processed by factor analysis which rotated the 130 test items orthogonally. Six interpretable factors were identified for use in curriculum development. The major interest of this study was directed toward determining the common training requirements of secondary school level vocational instructors.

Coster and Courtney (1965) utilized factor analysis to study various agriculture competencies among agriculture workers in three selected

occupations. Tuckman's (1969) SCOPE study utilized factor analysis to test a three-dimensional, domain-process-object taxonomy to classify educationally-relevant behavior.

The use of a check list to gather task data from employees in the field has been found to be a valid method in task analysis, and has been used by the previously mentioned studies. Courtney (1967) developed a device used for establishing the core of professional knowledge and the abilities required in training programs for vocational education teachers. The knowledge and skills described in the research instrument included items selected from a review of the literature, and utilized a consulting group of specialists from business, industry, and vocational education. A similar technique was used by Crawford (1969), Gunderson (1971), Lindahl (1971), and Miller (1971).

To identify clusters of knowledge and competencies needed by merchandising employees, Ertel (1966) administered a check list to employees to obtain facts about the major types of tasks required. Ertel's method may be thought of as unique in that task lists were not submitted to employees in a randomly selected group of stores, but only to those businesses considered as modern "leading edge" firms where the nature of the work performed was most likely to represent the prevailing direction for the foreseeable future.

Sjorgen (1967) used a three-day training period to familiarize respondents with the instrument's procedures, in a study to identify common behavioral factors as a basis for pre-entry preparation of workers for gainful employment. The instrument was personally administered to respondents at their homes or places of business. While

completing the questionnaire, each respondent had a copy of the scale descriptions for periodic reference.

Use of the cognitive taxonomy is not necessarily restricted to or functional only for curriculum improvement in vocational education. Kirsner (1968) demonstrated how specific behavioral objectives formulated within the hierarchy of the major levels and sub-levels of Bloom's taxonomy of educational objectives can easily be applied to teacher preparation in educational psychology programs.

Although not using the cognitive taxonomy specifically, Yagi (1968) illustrated how vocational education curricula could be evaluated through functional job analysis, utilizing a taxonomic structure to classify the competencies of vocational instructors. The study recognizes the value of job analysis as a basis for development of new curricula, and to describe, analyze, and compare different programs of instruction. Yagi examined a problem wherein no one seemed to know how courses of apparently the same content, different content, and courses in different schools could be compared, contrasted, or evaluated. The results of the study provided a framework for evaluating and comparing existing programs, and establishing the criteria for the design of different curricula. During the process of the study, Yagi found the background and training of the raters used did not affect their ability to apply the taxonomy. The taxonomy was equally applicable to any vocational course; and the taxonomy used provided a relatively concise structure for ordering 20 distinctively different educational objectives. Data were collected from structured interviews, and from forms which contained statements referring to taxonomic categories.

CHAPTER III

THE DESIGN OF THE STUDY

Preparation of the Instrument

The instrument used in the study was a survey-type questionnaire designed primarily for mailing, but modified for personal administration to selected vocational education respondents. The questionnaire contained 99 professional education competencies in combination with a six-point ordinal scale corresponding to the major headings of Bloom's (1956) cognitive taxonomy. The scale permitted each respondent to judgmentally score the taxonomic level considered necessary for adequate behavior required by the responsibilities of his work. Essentially, the instrument was a slight modification of the one used by Gunderson (1971), Lindahl (1971), and Miller (1971) in their four-Western-state study to determine the degree of task proficiencies required for vocational educators at the community college level.

Because the purpose of this study was to determine the hierarchical structure within each of the originally developed 99 professional competencies, except for minor additions to facilitate applications to secondary school responses, the 99 competencies remain essentially unchanged. Examination of the structuring process used to compile the list of professional competencies indicated it to be satisfactory. The literature indicates similar processes utilizing juries of business and education experts were used in the research of Courtney (1967), Crawford (1971), Halfin and Courtney (1970), Rahmlow (1966), and Simpson (1966).

To gain practice and insight into the problems that might arise during administration of the instrument to the study's respondents, a field test of the instrument was conducted. A pilot study group was selected arbitrarily from current and former candidates of the Oregon Vocational Education Leadership Development Program. To simulate actual study conditions, each pilot respondent was asked by letter for assistance and participation. A response card was enclosed, and appointments were made with individual test respondents.

Ten test respondents were asked to complete the questionnaire under anticipated study conditions, and additionally asked to identify those printed instructions in the questionnaire which were difficult to interpret. Each was asked to make suggestions which would assist in clarifying instructions and methods used in the personal presentation and explanation. Each suggestion was discussed with the test respondent, and repeated with the next respondent for experimentation. Following the field test procedures, only minor revisions were required prior to the preparation of the final instrument.[1]

The Dependent Variable

The dependent variable in the study was a score assigned by respondents on a six-point ordinal scale to indicate the hierarchical level they considered necessary in their work for each of the 99 professional education competencies. Respondents were asked to indicate professional judgments based upon their teaching experience. Hierarchical values and major heading designations corresponded exactly to those

[1] See Appendix A for a copy of the instrument.

presented in Bloom's taxonomy:[1] (1) Knowledge, (2) Comprehension, (3) Application, (4) Analysis, (5) Synthesis, and (6) Evaluation.

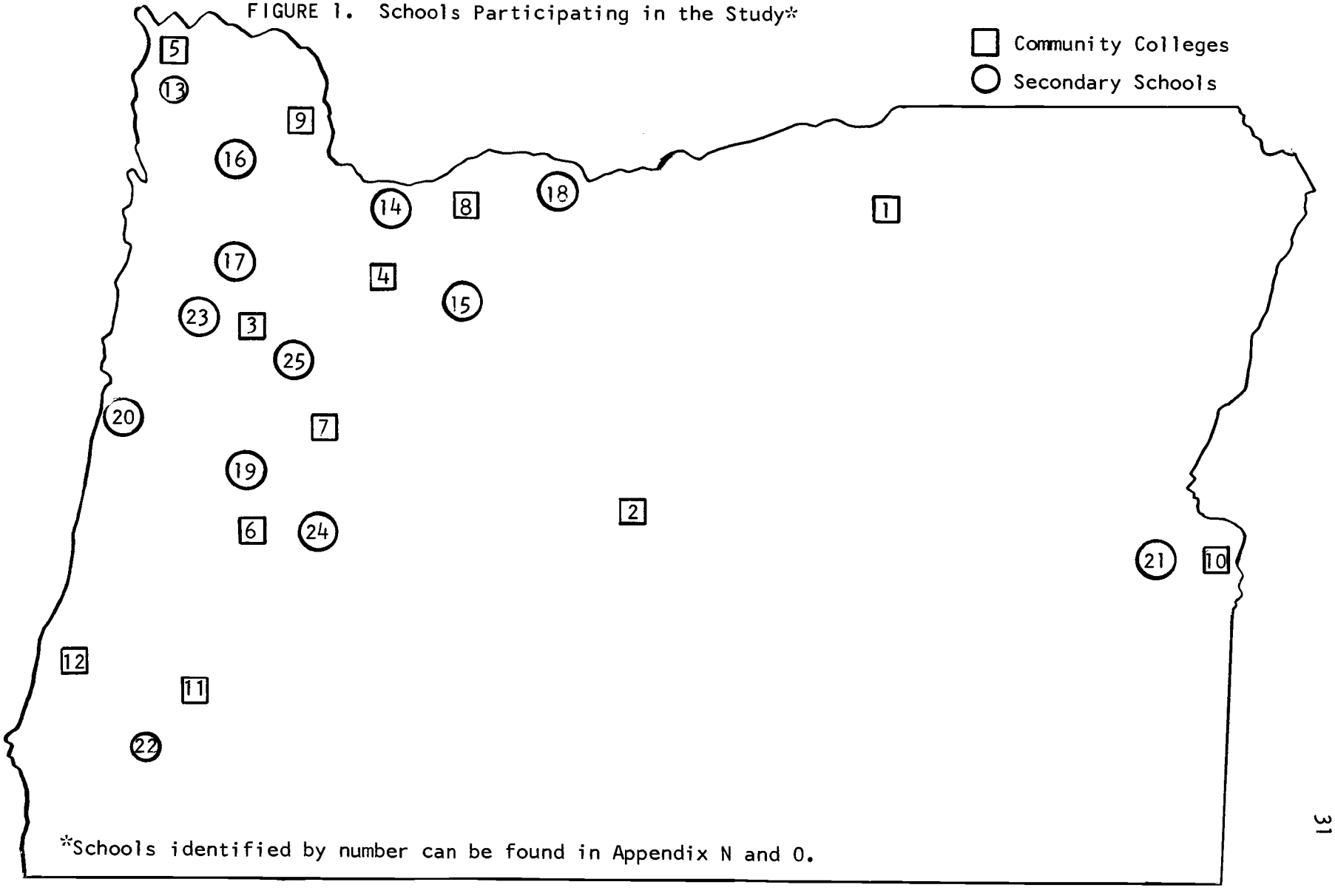
Selection of the Sample

The population used in the study consisted of selected effective vocational education instructors from Oregon's community colleges and secondary schools. Four instructors were recommended by the Deans of Instruction or Directors of Vocational Education at each of the institutions; four instructors were recommended from each of the 13 randomly selected secondary schools by the building principals. Not all recommended secondary school respondents were able to take part in the study, and one community college instructor did not teach in a typical vocational-technical area, causing a subsequent disqualification. However, both independent populations were balanced with 47 respondents each. Hence, the total sample used in the study consisted of 94 respondents who represented vocational-technical instructors in Oregon's community colleges and secondary schools.

Three criteria were considered for the selection of the secondary schools sampled. First, the school had to offer diverse vocational education programs; second, the vocational education staffs had to be of sufficient size to permit the building principal a reasonable opportunity to select one or more effective instructors as respondents. Thirdly, secondary schools meeting the first two criteria had to be broadly distributed within the state so as to offer each geographical area and corresponding populations an equal opportunity for participation

[1] See Appendix B for a complete description of the taxonomy.

FIGURE 1. Schools Participating in the Study*



*Schools identified by number can be found in Appendix N and O.

in the study. The primary population meeting these criteria consisted of 138 secondary schools with a minimum student population of 200 or more. Secondary schools used in the study were randomly selected.[1] The total number of full-time vocational-technical instructors employed in the state at the time of the study was approximately 944.

Effective teachers were considered as those judged as being effective in their work by their major supervisors. The criteria used for selection of the instructors were identified by Cosgrove[2] as specific factors of teacher effectiveness, and are as follows:

A. Knowledge and organization of subject matter.

B. Adequacy and relations with students in class.

C. Adequacy of plans and procedures in class.

D. Enthusiasm in working with students.

An analysis of the Q-Mode data generated by the studies of Gunderson (1971), Lindahl (1971) and Miller (1971) indicated that no major differences existed among the responses of the community college instructors examined in California, Colorado, Oregon, and Washington. Therefore, it was assumed a valid approach to confine the determination of the hierarchical levels of the 99 professional competencies to Oregon's 12 community colleges. The results of Cotrell's (1970) study, in which few differences were found between secondary school and post-secondary vocational instructors in 19 states and 7 occupational service areas, further suggested that the same assumption could be applied to Oregon's secondary schools.

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[1] A Table of Random Numbers was used to select the sample.

[2] See Gage (1963) p. 341.

The Statistical Design

The major focus of this study was to determine the hierarchical structure of common professional education competencies needed by community college and secondary school vocational education instructors. Research by Gunderson, Lindahl, and Miller, and that by Crawford (1969), Cotrell (1970), and Halfin and Courtney (1970), provided the foundation for the general design of this study which includes the following elements:

A. The population for the study consisted of full-time vocational-technical instructors from Oregon's community college and secondary schools. A total sample of 94 vocational instructors, selected by their supervisors, provided the field data by completing the personally administered instructor questionnaire containing 99 professional education competencies.

B. Based on their teaching experiences, respondents were asked to react to each of the 99 competencies by indicating on a six-point ordinal scale the hierarchical level they considered to be necessary in the performance of their responsibilities as teachers.

C. Clusters of competencies were generated through the use of factor analytic modes known as the Q-Mode and R-Mode. The modes take on the following characteristics for the study.

   1. The Q-Mode analysis essentially involves the ordering of respondents according to the competencies

included in the study. Thus, this form of analysis provides a measure of commonality among the various vocational instructors comprising the sample.

2. The R-Mode is one which orders competencies according to the respondents included in the study, and provides for a clustering of competencies according to the hierarchical structure of the responses. Hence, the 99 dependent variables studied were grouped hierarchically through this analysis mode.
3. Competencies with rotated factor loadings of $\pm$.450 or larger were considered for inclusion of the item in a factor or cluster.[1]

D. A subsequent statistical test was made on the data to contrast the differences between the responses of the community college and secondary school vocational instructors. The description of the test is as follows:

The median test[2] (a non-parametric test of significance) is a procedure for testing whether two independent groups differ in central tendencies, and utilizes the Chi-square statistic in its computation. The median test provides information regarding whether it is likely that two groups have been drawn from populations with the same medians. The median test may be used when the scores of the two

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[1]See Fruchter (1954): Factor loadings of .20 or less are usually regarded as insignificant, loadings of .20 to .30 as low; .30 to .50 as moderate; .50 to .70 and above as high.

[2]See Siegel (1956) p. 111.

groups are at least of an ordinal scale level.[1] For describing the central tendency of scores in an ordinal scale, the median[2] is the most appropriate statistic. Since N>40 and no cell frequency was less than 5, χ^2 corrected for continuity[3] was used to test the null hypothesis (for each of the 99 professional competency items) that there is no significant difference between the median of the community college sample and the median of the secondary school sample. The critical region for the null hypothesis was set at $\alpha = .05$ with the degrees of freedom equal to 1. The Chi-square table was used in determining the theoretical values for the test of significance. The null hypothesis was considered as being rejected when the computed value exceeded or equalled the tabular value.

Collection of Data

The Division of Vocational, Adult, and Community College Education was requested to provide support and assistance in securing cooperation from the community colleges and secondary schools included in the sample. The required support necessary to conduct research in Oregon's community colleges was granted by the Executive Secretary of the Oregon Community College Association.

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[1] Ibid., p. 111.

[2] Ibid., p. 25.

[3] Ibid., p. 110; also Koenker (1961), p. 109-114.

Deans of Instruction and Directors of Vocational-technical Education in each of the community colleges, and the building principals in each secondary school selected for participation, were asked for their willingness to cooperate in the study. A copy of the letter sent to the administrators will be found in Appendix C. Cooperation of the schools' administrators was necessary since each agency was expected to determine and select potential respondents from its vocational education staff. Enclosed with each letter to the administrators was a final copy of the Instructor Questionnaire, and a response card indicating a willingness to participate.

To assist in maintaining the confidential selections of the instructional supervisors, a special letter and separate self-addressed stamped envelope was sent to schools willing to participate in the study, asking for the names of recommended respondents.[1] Individual letters[2] were sent to the instructors listed by administrators. Appointments were scheduled for each participating school, and individual testing arrangements made with each respondent on the day of the appointment. When schools or individuals did not wish to participate, alternate secondary schools and respondents were selected in the same manner as that previously described. Selected institutions not responding to the request for participation were followed up by telephone.

In a personal interview setting, the selected respondent was given an Instructor Questionnaire with a simplified description of Bloom's cognitive taxonomy. Each test instrument required approximately 45 minutes to complete. Prior to the completion of the instrument, an

[1]See Appendix D for a copy of the letter used.

[2]See Appendix E for a copy of the letter used.

average of 45 minutes was required to explain and describe the taxonomy and its application to the study's design. Instruction aids[1] were used for the explanation phase and respondents were encouraged to ask questions during the administration of the instrument. Respondents were also encouraged to review the taxonomic materials and other information made available to them.

The final step in the data collection process was to check each instrument for full compliance of all instructions, prior to the transfering of the data to punch cards[2] for analysis on the Oregon State Open Shop Operating System (OS3), using the CDC 3300 computer at the Oregon State University Computer Center.

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[1] See Appendix B and F for materials used during the explanation.

[2] See Appendix I for coding of computer data cards.

CHAPTER IV

RESULTS OF THE ANALYSIS

Introduction

Participating secondary school student populations in the study ranged from 320 to 1,852 full-time enrollments, and were representative of high schools found in the rural and urban areas of Oregon. School populations are listed in Figure 2.

FIGURE 2. Distribution of Secondary School Populations

School Number	Population
13	746
14	1,538
15	1,282
16	954
17	665
18	830
19	431
20	449
21	704
22	320
23	1,852
24	1,063
25	405

The instructor questionnaire used in the study was administered through personal interview of 94 selected respondents in 25 participating schools offering vocational programs in Oregon. All instructional areas normally associated with vocational-technical education were represented by the sample respondents.

The Results of the Median Test Analysis

The Median Test[1] was used to conduct 99 two-way classification analyses in the study. In each instance responses from 12 Oregon community colleges and 13 secondary schools were tested to determine whether the medians of the two independent groups differed significantly, and whether they were drawn from populations with the same median. The testing of the combined median, which cast the data into a 2 X 2 matrix showed, that except in two cases[2] the community colleges and secondary schools were alike in their responses. The results of these tests are found in Appendix H. The Median Test indicated that 97 of the 99 null hypotheses were retained. In only two instances were the null hypothesis rejected.

Results of Median Score Ranks

Each of the 99 competencies was ranked. Rankings were based upon the combined median score for each of the professional competencies. The ten competencies with the highest median scores are contained in Table 6. The ten competencies with the lowest median scores are contained in Table 7. Median score ranks of all competencies are included in Tables 1 through 5.

Results of Factor Analysis

A factor analysis method was used for the purpose of determining the specific factors which were present among the 99 competencies

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[1] See Appendix G for an example and summary of the procedures used.

[2] The two cases rejected were competencies 15 and 19.

included in the study. The procedures used permitted the identification of groups or clusters of competencies in which, according to generated factor loadings, there existed a high degree of correlation with the extracted factors. Only those competencies with factor loadings of $\pm$.450 or greater were included in a factor. The results of the factor analysis were generated through the factor analytic techniques known as the Q-Mode and R-Mode. A description of the computer control data can be found in Appendix J and Appendix K. Analysis descriptions are shown below.

Seven of the ten highest ranked competencies clustered under Factor II, one of these being spurious, having a factor loading of less than -.450. The remaining three competencies clustered under Factor IV.

Seven of the ten lowest ranked competencies clustered under Factor I, one being spurious. Two competencies clustered under Factor III with one spurious item; the remaining competency appearing as a spurious item in Factor V. The composition of Factor V is explained on page 58.

Q-Mode Analysis

The function of the Q-Mode[1] technique is to indicate the extent which respondents resemble each other relative to their answers to the 99 professional competencies. It essentially involves the ordering of respondents according to the competencies in the study, and provides a measure of commonality among the numerous vocational-technical areas

[1]See Appendix J for control card data.

represented by the respondents. Results of the four-factor Q-Mode solution indicated that, in all instances, factor loadings were +.91 or higher. The tabulated results of the Q-Mode technique can be found in Appendix L.

R-Mode Analysis

Generally, the R-Mode technique was considered as one of the most important procedures in the study. The literature indicates that a great majority of factor studies have used the R-Mode technique. Primarily, the R-Mode[1] clusters competencies according to the respondents in the study. The data were factor-analyzed three times using six-, five-, and four-factor solutions. Figure 3 lists the common factor variance accounted for in the twelve factor solution, which also contains the common factor variances found in factor solutions six, five, and four. A sample of the R-Mode Analysis can be found in Appendix M.

Factors generated by the R-Mode analysis resulted in factor loadings of $\pm$.450 or higher. Negative loadings were considered in absolute terms. The five-factor and four-factor solutions resulted in the same total number of factor loadings in excess of $\pm$.450; however, the loadings in the five-factor solution were more evenly distributed among the factors. Therefore, the five-factor solution was considered to best represent the data. Results of the R-Mode analysis using the five-factor solution appear in Tables 1 to 5. Each table is illustrative of a factor, and contains factor loadings of $\pm$.450 and higher. Each table also contains a separate listing of spurious competencies, which are defined as

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[1]See Appendix K for control card data.

those loading highest under one factor but with factor loadings of less than ±.450. Factors and corresponding subfactor designations were assigned after the data were analyzed. The names of the factors were judgmentally assigned, and are assumed to be indicative of the general nature of the competencies which loaded under each factor. All significant loadings were clearly defined under one of the five generated factors. There was no factor overlap among the competencies which loaded ±.450 or higher.

FIGURE 3. Percentage of common factor variance for the R-Mode analysis

Factor	Percentage	Cumulative percentage
1	18.62441	18.62441
2	6.49158	25.11599
3	5.92563	31.04161
4	3.74408	34.78570
5	3.20282	37.98852
6	2.99807	40.98658
7	2.88956	43.87614
8	2.67003	46.54617
9	2.56542	49.11159
10	2.35793	51.46953
11	2.20393	53.67346
12	2.17584	55.84929

Factor I. Instructional Organization

A total of 24 competencies loaded under Factor I with a factor loading of -.478 or higher. Three subfactors were clearly identifiable within the primary factor. The first subfactor, Program Development, contained six competencies. Four competencies loaded under the subfactor, Program Operation. Program Coordination, the third subfactor,

contained two competencies. Factor I was the only factor with identifiable subfactors, and contained the grestest number of competencies. Factor I generally contained some of the lowest median rankings. Table I contains the specific competencies, factor loadings, response breakdown, median scores, and median ranks which were included in Factor I. Table 8 locates the Quantile Distribution[1] of each Domain Level (median) found in Factor I.

Factor II. Instructional Process

A total of eleven competencies with factor loadings of -.450 or higher were generated for Factor II. The competencies listed pertain directly to the instructional process. Identifiable subfactors are not apparent. Table 2 contains the specific competencies and other data included in Factor II. Table 8 locates the Quantile Distribution of each Domain Level (median) found in Factor II.

Factor III. Professional Image

Eleven competencies clustered under this factor with factor loadings of .456 and above. The competencies appearing in this factor pertain to professional activities concerning the relationship of the instructor with groups of individuals and organizations. Items which reflect upon his personal habits and characteristics are also included. Factor III generally contained some of the lowest median rankings. Table 3 describes the specific competencies and other data included in Factor III. Table 8 locates the Quantile Distribution of each Domain Level (median) found in Factor III.

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[1]See page 58 for an explanation of the Quantile Distribution.

TABLE 1. Factor I - Instructional Organization

	Competency number	Competencies	Factor loading		Responses: Knowledge 1	Comprehension 2	Application 3	Analysis 4	Synthesis 5	Evaluation 6	Domain level (Mdn)	Median Ranking
Program Development	8.	interpret the innovative provisions of the Vocational Act as amended in 1968	-.607	cc	16	13	12	2	2	2	1.574	98
				ss	11	14	7	6	2	7		
	12.	interpret the goals of general education	-.523	cc	3	9	15	11	3	6	3.738	62
				ss	1	5	9	10	7	15		
	16.	interpret the history of vocational education	-.523	cc	20	16	7	2	1	1	1.917	97
				ss	12	20	5	1	4	5		
	18.	interpret state certification requirements for instructors	-.536	cc	6	24	10	3	-	4	2.229	96
				ss	6	24	9	2	1	5		
Program Development	19.	assist in the development of the total (community college/secondary school) program	-.602	cc	5	4	8	14	6	10	4.289	48
				ss	4	7	4	5	5	22		
Program Development	23.	interpret the state specifications and requirements for vocational facilities.	-.614	cc	10	8	15	4	7	3	3.120	77
				ss	4	7	14	8	3	11		

TABLE 1. (Continued)

Subfactor	Competency number	Competencies	Factor loading		Responses: Knowledge 1	Comprehension 2	Application 3	Analysis 4	Synthesis 5	Evaluation 6	Domain level (Mdn)	Median Ranking
Program Development	25.	interpret the philosophy of the comprehensive (community college/ secondary school)	-.633	cc	5	9	13	9	3	8	3.220	76
				ss	5	10	12	6	3	11		
	30.	interpret the philosophy of the (community College/secondary school) in providing vocational programs for the student	-.523	cc	1	6	12	10	8	10	4.150	54
				ss	4	3	8	10	4	18		
Program Operation	40.	provide special training or assistance to disadvantages and handicapped students	-.481	cc	4	7	11	9	7	9	3.467	68
				ss	4	3	19	7	7	7		
Program Development	41.	use the State Plan for Vocational Education in securing reimbursement for vocational programs	-.603	cc	15	9	13	4	3	3	2.574	95
				ss	10	11	14	2	4	6		
	43.	interpret the history of education	-.554	cc	22	12	9	1	2	1	1.543	99
				ss	23	15	6	2	-	1		
	45.	formulate your own educational philosophy	-.515	cc	2	-	5	8	6	26	5.540	20
				ss	3	3	8	3	7	23		

TABLE 1. (Continued)

Subfactor	Competency number	Competencies	loading		Responses: Knowledge 1	Comprehension 2	Application 3	Analysis 4	Synthesis 5	Evaluation 6	Domain level (Mdn)	Median Ranking
Program Development	46.	utilize state guidelines for curriculum planning	-.597	cc	2	11	11	12	3	8	3.425	71
				ss	4	5	16	5	2	15		
Program Coordination	48.	identify the similarities and differences between the goals of general and vocational education	-.648	cc	5	4	8	11	9	10	4.184	52
				ss	3	3	11	8	4	18		
	52.	interpret the objectives of vocational education to others	-.530	cc	1	6	11	13	7	9	3.889	59
				ss	2	8	12	5	4	16		
Program Coordination	55.	conduct community surveys to improve instruction or plan programs	-.596	cc	8	8	8	8	5	10	3.375	74
				ss	7	10	8	9	3	10		
	63.	distinguish between two or more educational philosophies	-.518	cc	6	6	10	19	2	4	3.000	83.5
				ss	10	8	7	12	3	7		
Program Operation	71.	use counseling techniques to help students solve personal and social problems	-.478	cc	-	8	17	9	6	7	3.409	73
				ss	4	5	16	5	3	14		

TABLE 1. (Continued)

Subfactor	Competency number	Competencies	Factor loading		Responses: Knowledge 1	Comprehension 2	Application 3	Analysis 4	Synthesis 5	Evaluation 6	Domain level (Mdn)	Median Ranking
Program Development	83.	interpret the socio-economic class structure of the local community in relation to students enrolled in vocational programs.	-.616	cc	9	8	10	6	7	7	3.452	72
				ss	1	9	11	9	6	11		
	84.	identify acceptable community social behaviors for instructors	-.483	cc	7	10	12	11	2	5	3.042	80
				ss	7	11	12	11	-	6		
	86.	identify local community power structures and pressure groups	-.505	cc	13	7	6	12	3	6	3.000	83.5
				ss	7	10	4	14	4	8		
	89.	interpret school policies	-.509	cc	3	9	15	9	4	7	3.333	75
				ss	4	11	9	8	3	12		
Program Operation	90.	provide programs for the student with special needs	-.500	cc	2	6	7	8	7	17	4.633	39
				ss	1	1	12	8	8	17		
Program Operation	92.	write articles for news releases	-.627	cc	15	12	11	5	3	1	2.707	92
				ss	7	7	18	6	3	6		

TABLE 1. (Continued)

Subfactor	Competency number	Competencies	Factor loading		Responses: Knowledge 1	Comprehension 2	Application 3	Analysis 4	Synthesis 5	Evaluation 6	Domain level (Mdn)	Median Ranking
		Spurious Competencies										
	1	Assist (com col/sec sch) administrators initiate and maintain vocational programs	-.419	cc	-	-	7	6	9	25	5.613	12.5
				ss	-	1	10	5	3	28		
	2	Interpret the provisions of instructor tenure laws	-.413	cc	14	16	9	6	1	1	2.794	88
				ss	8	26	8	-	-	5		
	14	Participate in the supervision of non-vocational extracullar activities	-.370	cc	11	14	14	4	4	-	2.688	93
				ss	8	8	18	6	2	5		
	17	Relate technological advances to laboratory and classroom instruction	-.304	cc	-	1	3	10	9	24	5.000	32
				ss	2	1	11	7	3	23		
	20	Interpret state certification requirements for instructors	-.169	cc	1	3	7	2	11	23	5.613	12.5
				ss	1	-	5	8	3	30		

TABLE 1. (Continued)

Subfactor	Competency number	Competencies	Factor loading		Responses 1 Knowledge	2 Comprehension	3 Application	4 Analysis	5 Synthesis	6 Evaluation	Domain level (Mdn)	Median Ranking
	22	Secure on-the-job training positions for students	-.396	cc	2	4	10	7	9	15	4.206	50
				ss	4	5	10	10	2	16		
	34	Interpret the legal liabilities of a teacher	-.313	cc	7	17	9	10	2	2	3.100	79
				ss	5	13	16	7	2	4		
	36	Relate to students from different socio-economic backgrounds	-.379	cc	1	1	12	9	6	18	4.182	53
				ss	-	9	9	13	5	11		
	51	Relate the vocational program to other instructional programs	-.409	cc	1	6	11	10	10	9	4.452	42
				ss	-	2	7	11	8	19		
	65	Use a student centered teaching style	-.431	cc	1	-	5	9	7	25	5.250	26.5
				ss	-	1	12	7	9	18		
	66	Identify students in need of counseling or guidance	-.391	cc	1	-	1	16	8	21	4.619	40
				ss	2	3	6	13	4	19		

TABLE 1. (Continued)

Subfactor	Competency number	Competencies	Factor loading		Responses: Knowledge 1	Comprehension 2	Application 3	Analysis 4	Synthesis 5	Evaluation 6	Domain level (Mdn)	Median Ranking
	73	Aid students in entering educational or occupational training programs beyond the (comm col/sec sch) level	-.439	cc	2	4	12	7	9	13	4.312	47
				ss	1	3	12	9	5	17		
	77	Lead a conference	-.434	cc	1	10	9	12	6	9	3.552	67
				ss	7	6	13	6	3	12		
	94	Conduct follow-up studies for purposes of determining effectiveness of instruction	-.394	cc	-	1	5	16	6	19	5.071	30
				ss	-	-	8	2	14	23		
	96	Articulate your instructional program with other educational institutions or agencies	-.368	cc	1	-	8	13	11	14	4.370	44
				ss	1	5	12	10	7	12		
	98	Screen and select students for your program	-.442	cc	11	7	3	8	4	14	3.767	61
				ss	8	4	10	7	5	13		
	99	Coordinate and supervise cooperative work experience programs	-.411	cc	2	4	10	11	5	15	4.333	46
				ss	3	5	13	1	7	18		

TABLE 2. Factor II - Instructional Process

Competency number	Competencies	Factor loading		Responses: Knowledge 1	Comprehension 2	Application 3	Analysis 4	Synthesis 5	Evaluation 6	Domain level (Mdn)	Median Ranking
13	provide practical shop or laboratory experiences to enhance classroom learning	-.529	cc	-	-	2	3	8	34	5.956	1
			ss	-	-	1	4	8	34		
33	motivate students in the classroom, shop or laboratory	-.597	cc	-	-	2	2	6	37	5.819	4
			ss	-	-	7	3	5	32		
37	utilize individualized instruction materials and techniques	-.510	cc	-	1	11	2	9	24	5.578	17
			ss	-	-	6	7	7	27		
49	develop classroom instruction based upon the individual needs of the learner	-.546	cc	-	-	2	7	9	29	5.729	7
			ss	-	1	3	3	8	32		
50	provide appropriate practice for development of basic skills	-.476	cc	-	3	3	7	10	24	5.630	9.5
			ss	-	1	4	7	5	30		
56	use the information contained in professional journals for personal improvement of instruction	-.510	cc	-	2	15	8	6	16	3.611	64
			ss	2	2	21	10	2	10		

TABLE 2. (Continued)

Competency number	Competencies	Factor loading		Responses: Knowledge 1	Comprehension 2	Application 3	Analysis 4	Synthesis 5	Evaluation 6	Domain level (Mdn)	Median Ranking
59	teach at the student's level and rate of learning	-.595	cc	-	-	2	8	4	33	5.766	6
			ss	-	-	3	5	8	31		
61	maintain student attention during classroom presentations or demonstrations	-.560	cc	-	-	9	7	8	23	5.147	29
			ss	-	1	13	6	9	18		
78	develop student learning activities to facilitate instruction	-.566	cc	-	-	4	11	10	22	5.520	22
			ss	-	-	8	5	8	26		
81	relate current events associated with your subject matter area to classroom instruction	-.453	cc	-	1	11	11	7	17	4.342	45
			ss	2	1	16	8	9	11		
93	be stimulating in your work as an instructor	-.468	cc	-	-	4	3	9	31	5.630	9.5
			ss	-	-	8	2	14	23		
	Spurious Competencies										
3	Conduct a shop or laboratory demonstration for an individual student	-.443	cc	-	1	4	5	9	28	5.618	11
			ss	-	-	3	6	8	30		

TABLE 2. (Continued)

Competency number	Competencies	Factor loading		Responses: Knowledge 1	Comprehension 2	Application 3	Analysis 4	Synthesis 5	Evaluation 6	Domain level (Mdn)	Median Ranking
6	Ask questions during classroom presentations or demonstrations to aid student learning	-.412	cc	-	1	1	8	11	26	5.578	17
			ss	-	-	1	11	10	25		
9	Select appropriate equipment and supplies for instructional purposes	-.446	cc	-	1	4	4	8	30	5.809	5
			ss	-	-	1	4	4	38		
10	Arrange and conduct field trips	-.387	cc	1	2	11	11	2	20	5.250	26.5
			ss	1	1	6	8	6	25		
27	Revise courses in accordance with current occupational trends	-.336	cc	-	-	2	5	11	29	5.519	23
			ss	-	-	3	4	11	29		
39	Interpret your vocational program to others	-.302	cc	-	6	2	13	9	17	5.000	32
			ss	-	3	5	11	5	23		
44	Build a display for instructional purposes	-.425	cc	2	7	14	7	6	11	3.929	57
			ss	1	6	11	7	7	15		

TABLE 2. (Continued)

Competency number	Competencies	Factor loading		Responses: Knowledge 1	Comprehension 2	Application 3	Analysis 4	Synthesis 5	Evaluation 6	Domain level (Mdn)	Median Ranking
47	Draw from personal avocational interests to enrich instruction	-.231	cc	-	1	7	11	11	17	4.868	35
			ss	-	3	13	5	8	18		
72	Summarize classroom presentations	-.354	cc	-	3	5	12	8	19	4.912	34
			ss	-	3	9	8	9	18		
91	Use programmed learning materials	-.353	cc	1	10	11	9	6	10	3.864	60
			ss	3	1	13	13	4	13		
97	Interpret safety rules and regulations to students	-.385	cc	3	8	9	7	5	15	4.045	56
			ss	3	4	14	4	5	17		

TABLE 3. Factor III - Professional Image

Competency number	Competencies	Factor loading		Responses: 1 Knowledge	2 Comprehension	3 Application	4 Analysis	5 Synthesis	6 Evaluation	Domain level (Mdn)	Median Ranking
7	adapt your appearance and appeal to acceptable standards for instruction	.527	cc	6	1	21	-	8	11	2.678	94
			ss	5	6	16	3	3	14		
29	adhere to the code of ethics adopted in your (community college/secondary school)	.746	cc	5	3	12	7	9	11	3.567	66
			ss	2	6	18	8	4	9		
42	organize or work with local vocational advisory committee	.474	cc	2	3	8	8	8	18	4.136	55
			ss	3	5	9	3	5	22		
58	maintain a clean, orderly laboratory or classroom	.604	cc	3	3	20	6	4	11	3.446	69
			ss	3	3	17	4	8	12		
67	participate in professional organizations related to your subject matter area	.598	cc	2	2	14	8	7	14	3.625	63
			ss	4	7	16	8	4	8		
70	utilize the services of local and state vocational education agencies	.469	cc	5	9	16	11	1	5	3.118	78
			ss	5	7	18	5	3	9		

TABLE 3. (Continued)

Competency number	Competencies	Factor loading		Responses: Knowledge 1	Comprehension 2	Application 3	Analysis 4	Synthesis 5	Evaluation 6	Domain level (Mdn)	Median Ranking
75	maintain discipline in the classroom, shop or laboratory	.614	cc	-	3	17	7	2	18	4.222	49
			ss	-	2	12	11	5	17		
76	participate in outside trade, business, or professional organizations related to your subject matter area	.545	cc	2	3	15	5	9	13	3.441	70
			ss	3	7	19	9	3	6		
79	communicate your ideas or point of view to other instructors or administrators	.456	cc	-	-	8	11	13	15	4.813	36
			ss	-	1	8	14	3	21		
82	inform students of the nature and requirements of specific occupations	.640	cc	2	3	7	5	12	18	4.675	37
			ss	1	4	9	9	12	12		
85	work cooperatively with people in the community	.572	cc	2	2	13	9	8	13	3.912	58
			ss	1	4	18	8	6	10		
	Spurious Competencies										
4	Involve yourself in civic community activities not directly related to the school	.410	cc	7	7	18	5	5	5	2.910	86
			ss	3	14	21	5	1	3		

TABLE 3. (Continued)

Competency number	Competencies	Factor loading		Responses 1—Knowledge	2—Comprehension	3—Application	4—Analysis	5—Synthesis	6—Evaluation	Domain level (Mdn)	Median Ranking
15	Aid the student in obtaining job placement after training	.417	cc	2	4	6	7	10	18	4.382	43
			ss	2	5	13	10	4	13		
21	Locate available standardized tests	.226	cc	9	9	15	6	4	4	2.786	89.5
			ss	12	9	13	5	3	5		
28	Maintain student performance or progress records	.412	cc	2	2	12	11	4	16	4.642	38
			ss	-	3	10	6	3	25		
64	Maintain necessary report forms required by state or federal agencies	.401	cc	13	7	11	11	3	2	2.786	89.5
			ss	7	12	17	6	2	3		
88	Make use of available guidance and counseling services within the (community college/secondary school)	.351	cc	2	3	15	12	5	10	3.000	83.5
			ss	2	5	20	9	5	6		

Factor IV. Preparation for Instruction

Eleven competencies were clustered under this factor with loadings of .455 and higher. The items listed in this factor pertain directly to instructional preparation and evaluation of instructional results. Identifiable subfactors were not apparent. Table 4 contains the specific competencies and other data included in Factor IV. Table 8 locates the Quantile Distribution of each Domain Level (median) found in Factor IV.

Factor V. Extracurricular Activities

This factor did not meet the criteria established for the naming of a factor, but is included to account for the 99 competencies contained in the study. Two spurious competencies with factor loadings of .371 and .372 are contained in this item. Both are ranked in the lower 10 percent of the median ranking. Table 5 contains the specific competencies and other data included in Factor V. Table 8 locates the Quantile Distribution of each Domain Level (median) found in Factor V.

Quantile Distribution of Domain Levels (Medians)

The quantile distribution represents a useful method of describing a group of observations. A quantile is a concept, and percentiles, deciles, and quartiles are examples of it. A quantile is a point on a number scale which is assumed to underlie a set of observations. The quantile points on this scale are separated into three major quartile units, Q_1, Q_2, and Q_3, which divides the group of observations into four quarters. For example, Q_1 is that point on the number scale such that one-fourth of the observations lie below it; one-half below Q_2, and three-quarters below Q_3. For convenience and ease in understanding the

relationship of the domain distributions, the combined medians generated in the median test have been placed in quartile (Q_1, Q_2, and Q_3) and percentile ($P_1,\ldots,P_{99}$) units. Thus, the domain levels (medians) of the 99 competencies have been distributed as follows:

Q_1 (P_{25}) = 3.220

Q_2 (P_{50}) = 4.200

Q_3 (P_{75}) = 5.250

Table 8 contains the Quantile Distribution of the Domain Levels (medians) found in the study for the 99 professional competencies.

TABLE 4. Factor IV - Preparation for Instruction

Competency number	Competencies	Factor loading		Responses: Knowledge 1	Comprehension 2	Application 3	Analysis 4	Synthesis 5	Evaluation 6	Domain level (Mdn)	Median Ranking
11	interpret the goals and objectives of vocational education	.479	cc	2	2	6	12	8	17	5.286	25
			ss	1	3	4	6	6	27		
24	develop audio-visual materials for instructional purposes	.559	cc	1	4	8	8	11	15	4.570	41
			ss	1	2	8	11	3	22		
31	select textbooks and instructional materials for the classroom, shop or laboratory	.459	cc	-	-	2	7	3	35	5.922	2
			ss	-	1	2	9	6	29		
32	develop objective tests to measure achievement	.603	cc	-	-	3	8	5	31	5.900	3
			ss	1	-	2	8	7	29		
38	relate the course of study to measurable performance objectives	.694	cc	-	-	-	6	15	26	5.596	14.5
			ss	1	1	4	4	11	26		
53	break down an occupation or job into its component parts for instructional or guidance purposes	.540	cc	1	1	4	9	11	21	5.150	28
			ss	1	2	7	9	9	19		

TABLE 4. (Continued)

Competency number	Competencies	Factor loading		Responses 1 Knowledge	2 Comprehension	3 Application	4 Analysis	5 Synthesis	6 Evaluation	Domain level (Mdn)	Median Ranking
54	write performance objectives	.677	cc	-	2	3	5	7	30	5.660	8
			ss	3	4	4	3	7	26		
62	make a daily lesson plan	.455	cc	7	4	12	6	5	13	3.577	65
			ss	9	3	11	7	6	11		
68	evaluate the effectiveness of a classroom or laboratory demonstration	.544	cc	-	-	3	5	8	31	5.539	21
			ss	-	1	6	8	4	28		
74	develop performance tests to measure achievement	.621	cc	-	-	6	6	9	26	5.578	17
			ss	1	1	4	9	7	25		
80	develop subjective tests to measure achievement	.518	cc	2	5	8	8	8	16	4.200	51
			ss	2	6	10	12	5	12		
	Spurious Competencies										
5	Promote and teach adult vocational programs	.440	cc	1	5	3	7	8	23	5.000	32
			ss	5	-	11	3	4	24		

TABLE 4. (Continued)

Competency number	Competencies	Factor loading		Responses: Knowledge 1	Comprehension 2	Application 3	Analysis 4	Synthesis 5	Evaluation 6	Domain level (Mdn)	Median Ranking
26	Select appropriate audio-visual materials for instructional purposes	.415	cc	-	1	7	6	8	25	5.596	14.5
			ss	-	1	6	8	5	27		
57	Assess the validity, reliability, and difficulty of instructor-made tests	.449	cc	-	1	3	9	11	23	5.342	24
			ss	1	5	6	6	8	21		
60	Utilize written shop, classroom, and laboratory equipment organizational plans	.420	cc	2	6	13	14	4	8	3.000	83.5
			ss	1	3	22	6	7	8		
69	Use the results of standardized test scores for job placement	.449	cc	10	11	11	8	3	4	3.041	81
			ss	5	8	13	8	2	11		
95	Evaluate teaching effectiveness by measuring student achievement	.355	cc	-	1	3	9	7	27	5.541	19
			ss	-	-	2	11	12	22		

TABLE 5. Factor V - Extra-curricular Duties

Competency number	Competencies	Factor loading		Responses: Knowledge 1	Comprehension 2	Application 3	Analysis 4	Synthesis 5	Evaluation 6	Domain level (Mdn)	Median Ranking
	Spurious Competencies										
35	Direct, advise, or promote student participation in competitive events or youth organizations related to vocational education	.371	cc	8	8	21	3	3	4	2.853	87
			ss	4	5	13	5	5	15		
87	Operate duplicating equipment	.372	cc	17	5	18	3	1	3	2.730	91
			ss	13	3	21	-	3	7		

TABLE 6. Ten highest ranked professional education competencies based upon domain levels (median).

Median ranking	Competency number	Competencies	Domain levels (Mdn)	Factor
1	13	Provide practical shop or laboratory experiences to enhance classroom learning	5.956	II
2	31	Select textbooks and instructional materials for the classroom, shop, or laboratory	5.922	IV
3	32	Develop objective tests to measure achievement	5.900	IV
4	33	Motivate students in the classroom, shop, or laboratory	5.819	II
5	9	Select appropriate equipment and supplies for instructional purposes	5.809	Spurious* (II)
6	59	Teach at the student's level and rate of learning	5.766	II
7	49	Develop classroom instruction based upon the individual needs of the learner	5.729	IV
8	54	Write performance objectives	5.660	IV
9.5	50	Provide appropriate practice for development of basic skills	5.630	II
9.5	93	Be stimulating in your work as an instructor	5.630	II

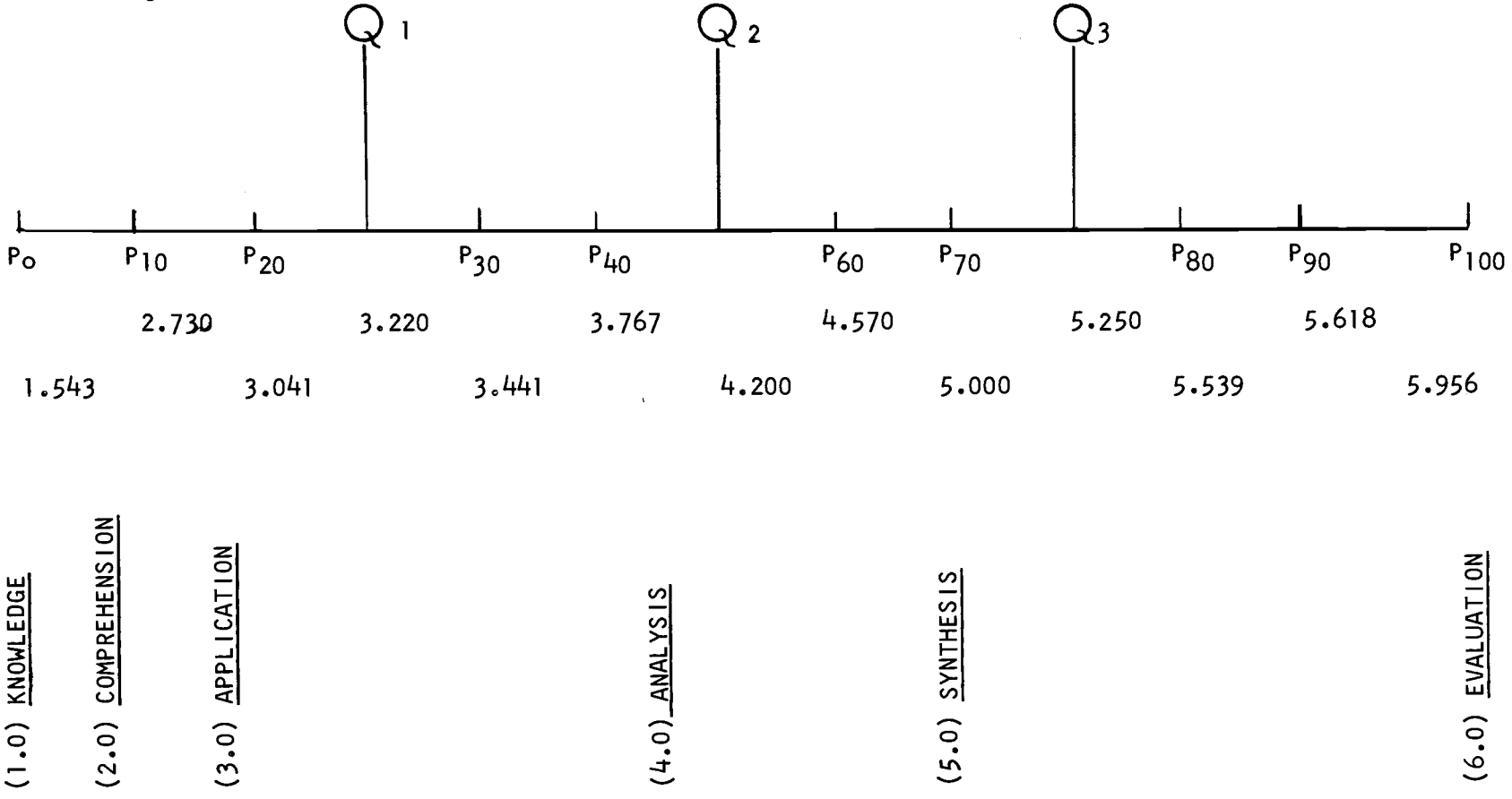
*Spurious competencies were considered as those with factor loadings of less than ±.450.

TABLE 7. Ten lowest ranked professional education competencies based upon domain levels (median).

Median ranking	Competency number	Competencies	Domain levels (Mdn)	Factor
89.5	21	Locate available standardized tests	2.786	Spurious* (III)
91	87	Operate duplicating equipment	2.730	Spurious* (V)
92	92	Write articles for news release	2.707	I
93	14	Participate in the supervision of non-vocational extracurricular activities	2.688	Spurious* (I)
94	7	Adapt your appearance and apparel to acceptable standards for instructors	2.678	III
95	41	Use the State Plan for Vocational Education in securing reimbursement for vocational programs	2.574	I
96	18	Interpret state certification requirements for instructors	2.229	I
97	16	Interpret the history of vocational education	1.917	I
98	8 E	Interpret the innovative provisions of the Vocational Education Act as amended in 1968	1.574	I
99	43	Interpret the history of education	1.543	I

*Spurious competencies were considered as those with factor loadings of less than ±.450.

TABLE 8. Quantile distribution* of domain levels (medians) based upon combined frequency of responses.



*Glass and Stanley (1970) p. 33-38.

CHAPTER V

SUMMARY, CONCLUSIONS, AND IMPLICATIONS

Restatement of the Problem and Procedures

The study contained one primary problem, to determine the hierarchical structure of the cognitive domain within 99 common professional education competencies for community college and secondary school vocational instructors. Findings were to be used in the construction of curricula relevant to vocational teacher preparation programs. Two dimensions were contained in the problem:

1. the quantitative analysis of data gathered from effective vocational education teachers in the field
2. development of behavioral implications from the data as they relate to the construction of curricula in terms of performance objectives and teaching strategies.

Concomitant with these dimensions was the determination of significant differences among selected vocational educators at the community college and secondary school levels according to the values generaged by the 99 professional education competencies. Respondents represented all of the occupational areas typically associated with vocational-technical education.

Data were gathered by a survey-type instrument originally designed for mailing, but modified for personal administration to a total of 94

respondents in Oregon's 12 community colleges and 13 randomly selected secondary schools.[1] Respondents were chosen by major school administrators in accordance with the four specific factors of teacher effectiveness identified by Cosgrove (Gage, 1965). The instructor questionnaire contained 99 professional education competencies developed by Gunderson (1971), Lindahl (1971), and Miller (1971). A six-point ordinal scale corresponding to the major headings of Bloom's cognitive taxonomy was added for this study.

Data were coded and analyzed on the Oregon State Open Shop Operating System (OS3) using the CDC 3300 computer at the Oregon State University Computer Center.[2] The *FAST Factor Analysis Program designed by Dr. Tjeerd van Andel at Oregon State University provided the analytical procedures for the clustering of factors.[3] Chi-square values developed in the Median Test[4] were computed manually on a desk-top calculator.

Summary of the Q-Mode and R-Mode Analyses

Values generated by the Median Test, used to conduct 99 two-way classification analyses, determined whether the two independent groups in the study differed in central tendencies. Except for two competencies[5] no significant difference existed between the median scores of community college and secondary school vocational education respondents.

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[1] A Table of Random Numbers was used to select the sample.

[2] Computer control card information can be found in Appendices I, J, and K.

[3] Q-Mode and R-Mode data control cards can be found in Appendices J and K.

[4] The Median Test can be found in Appendix G.

[5] Competencies 15 and 19 were rejected

The Q-Mode analysis generally supported the Median Test results by revealing that 94 respondents from 25 schools in the study resembled one another with regard to the generated values. Results of the Q-Mode analysis can be found in Appendix L. In all instances, factor loadings were +.91 or higher.

Results of the R-Mode solution extracted 57 professional competencies and identified four primary factors and one undeterminable factor as follows:[1]

Factor I - Instructional Organization, contained 24 competencies with three clearly identifiable subfactors: Program Development, Program Operation, and Program coordination. Factor I contained some of the lowest median rankings.

Factor II - Instructional Process, contained 11 competencies with no clearly identifiable subfactors. It additionally contained some of the highest median rankings.

Factor III - Professional Image, contained 11 competencies with no clearly identifiable subfactors. It contained a number of the lowest median rankings.

Factor IV - Preparation for Instruction, contained 11 competencies with no clearly identifiable subfactors. Factor IV contained some of the highest median rankings.

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[1] See Tables 1 to 5 for a complete listing and classification of all competencies examined in the study.

Factor V - Extra-curricular Duties, was not clearly identifiable since the two competencies loadings into this classification were generated below the ±.450 acceptable level set for factor identification. To account for all examined competencies, this factor was included as a spurious one.

Relationship of Factor Loadings, Domain Levels (Medians), and Median Rankings

As indicated by Krathwohl (1965), the greatest contribution of the taxonomic approach to curriculum development is to assist the instructor in spelling out the levels of behavior he is trying to bring about in the classroom. Through the statistical processes used to examine the 99 professional competencies in this study, several data were developed in Tables 1 to 7 that can guide the instructor or curriculum planner. The relationship of the data presented is useful in providing the foundation for a relevant program design and valid levels of expected terminal behavior.

The following interpretations of two selected competencies will assist in the analysis of the data contained in tables 1 to 7.[1]

[1]See footnote on page 34 for interpretation of factor loading.

Factor	Competency Number	Factor Loading	Median Level (Domain)	Median Ranking
III	29	+.746	3.567	66/99

Interpretation: This competency has the highest factor loading or correlation among the 57 specific competencies extracted by the R-Mode. For curriculum use, the teacher and planner may assume a high level of agreement between the community college and secondary school vocational instructors regarding their response to the competency. In terms of behavior, instruction should be planned at the Application (3) level, but not above Analysis (4). The Median Ranking indicates that 65 other competencies ranked higher in terms of domain level response.

I	43	-.554	1.543	99/99

Interpretation: This competency represents a moderately high factor loading from among the 57 specific competencies extracted by the R-Mode. For curriculum use, the teacher and planner may assume a high level of agreement between the community college and secondary school vocational instructors regarding their responses to the competency. In terms of behavior, instruction should be planned at the Knowledge (1) level, but not above Comprehension (2). The Median Ranking indicates 98 other competencies ranked higher in terms of domain level response. For the vocational curriculum planner, competency 43 (interpret the history of education) would have the lowest hierarchical level of all the competencies included in the study.

When deciding the use of a competency in curriculum development, the instructor and curriculum planner should analyze the data in the same manner described above. The Quantile Distribution, Table 8, must be used to locate the position of the Domain Levels (medians) in relation to all other medians. The use of Fruchter (1954) would be helpful to the planner in the interpretation of factor loadings. Briefly, factor

loadings are similar to the levels of correlation ranging from -1.0 to 0 to +1.0 (Kerlinger, 1964). Minus factor loadings are considered in absolute (positive) terms.

Conclusions

The determination of the hierarchical levels of 99 professional vocational competencies was the primary question to which the present study was directed. Domain Levels were calculated for each of the 99 professional competencies, and distributed as follows in the major classifications of the quantile scale: $Q_1(P_{25}) = 3.220$; $Q_2(P_{50}) = 4.200$; and $Q_3(P_{75}) = 5.250$. For the purpose of developing useful vocational teacher preparation curricula, it was concluded that 57 of the 99 professional competencies could be classified as having high levels of correlation, and could be grouped into four meaningful competency clusters typified by the study's sample population.

Significant differences or independence of the two groups in the study were produced by application of the Median Test. On the basis of the analysis applied in the Median Test, 97 of the 99 null hypotheses were retained. The hierarchical nature of the domain levels precluded the determination of the differences as being interpreted purely to chance.

The conclusion of commonality among the study's sample population was strengthened by strong correlations in the Q-Mode analysis. The data generated indicated vocational-technical educators resembled one another with regard to the hierarchical values assigned to the professional education competencies. The results of studies by Gunderson (1971).

Lindahl (1971), and Miller (1971), Halfin and Courtney (1970), and Cotrell (1970) generally tend to support these findings.

The application of the R-Mode technique to data gathered from a variety of vocational educators in the field resulted in the grouping of 57 professional competencies into four primary factors. Therefore, it may be concluded that factor analysis applied to data with numerous underlying variables is a useful technique for identifying common factors from among the different competencies and professional specialists. As utilized and described within this report, factor analysis can be considered as a useful method for obtaining information to be used in the development of curricula for vocational teacher preparation.

Implications

Using the review of the literature, the data analysis in this study, and its conclusions, the following statements are proposed as having significant implications for vocational pre-service and in-service teacher preparatory programs:

1. The universality of responses shown to exist between community college and secondary school vocational educators indicates that teacher preparatory programs founded upon common professional competencies would meet the majority needs of both educational levels. Therefore, the proliferating of courses to accommodate each level is unnecessary.

2. Since the results of this study indicate a similarity in many functional behaviors within the 99 professional competencies, it may be implied that the educational needs of vocational educators generally are not as complex or diverse as it may have been assumed.
3. The commonality of responses shown to exist among the respondents of this study, and the commonality found in the Western-states studies of Gunderson (1971), Lindahl (1971), and Miller (1971), suggest that the preparation and professional certification of community college and secondary school instructors may be accomplished through regional or reciprocal cooperative agreements between the states.
4. Marginal spurious competencies[1] with high domain levels and median ranking have special implications for the curriculum specialist. Since these competencies loaded at less than that considered as significant for a cluster, the professional experience of the curriculum planner may have to be called upon to judgmentally evaluate the use of such competencies in program planning. The statistical results imply sufficient disagreement exists among the study's respondents as to weaken the use of these competencies in the curriculum design.

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[1]For example, competencies numbered 1, 3, 6, 9, 20, and 26.

5. The results of the study suggest that vocational teacher preparatory programs should place greater emphasis on the individualization of instruction, teaching at individual learning rates, writing of performance objectives, evaluation of instruction, and interpretating the goals and objectives of vocational education.
6. The results of the analysis indicate that emphasis in the following areas of professional development does not need to extend beyond the Knowledge (1) or Comprehension (2) domain levels: interpretation of the history of education, interpretation of the innovative provisions of the Vocational Education Act as amended in 1968, interpretation of the history of vocational education, use of the State Plan for vocational education to secure reimbursement for vocational programs, adaptation of appearances, supervision of non-vocational extra-curricular activities, and others.
7. The commonality of agreement reflected by the respondents in this study would suggest vocational teacher preparatory programs be considered in terms of their relevancy to needed performance levels required in the field, as they are described in the cognitive domain.[1]

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[1]During the orientation phase of the testing procedures, it became apparent that many respondents were initially unsure of the application of Bloom's cognitive taxonomy to the learning process or development of educational objectives.

Suggestions for Further Study

The following suggestions for further study are made as a result of the findings and conclusions of this investigation:

1. It must be recognized as social and economic needs change, change will also occur in factor structures. To verify the reliability of the current study for use in future curriculum planning, the study should be periodically replicated as standard procedure.
2. The present study utilized a stratified population selected by school administrators, and does not answer the question of similar results emerging in other studies of the same type using a numerically randomized sample.
3. As determined by their administrators, the respondents in this study represented the most effective vocational educators on their teaching staffs; therefore, a comparative study using other than the most effective teachers may provide useful comparative data for curriculum development.
4. Behavioral objectives, instructional strategies, and methods of evaluation should be developed from the data, and incorporated into instructional materials for evaluation in an experimental setting.
5. It is recommended for other studies of this nature that the design be structured in such a manner as to determine the degree of overlap that may exist between all domain levels.

6. Since the literature suggests the existence of a useful relationship between Bloom's cognitive and Krathwohl's affective domains, this relationship should be examined for the purpose of improving vocational teacher preparation.
7. A composite data analysis should be conducted between the findings of this study and those of Gunderson (1971), Lindahl (1971), and Miller (1971).
8. Because this study was among the first of its kind to examine the hierarchical levels of the cognitive domain applied to professional educators, it is difficult to ascertain whether a credibility gap exists between the instructors' responses and actual practice. It is recommended that a study be conducted to examine these relationships.
9. It is suggested that levels of technical competencies needed to teach vocational subjects at the community college and secondary school levels be examined for all occupational areas.
10. It is suggested that a study be conducted to examine such variables among vocational educators as years of teaching experience, occupational experience, and others for their relationship to professional teaching competencies.

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APPENDICES

Name

Community College

Secondary School

INSTRUCTOR QUESTIONNAIRE

The Professional Education Competencies of Selected Community College and Secondary School Instructors

Purpose of Questionnaire: The purpose of this questionnaire is to seek your assistance in providing information which will be useful in the development of curriculum for colleges and universities seeking to offer relevant teacher education courses and programs for community college and secondary school vocational education instructors.

INSTRUCTIONS FOR COMPLETION OF THE QUESTIONNAIRE

A. In the spaces provided below, check (x) the appropriate subject matter area in which you teach the majority of your courses

( ) Agriculture (Forestry, Horticulture, Production)

( ) Business and Office

( ) Distributive (mid-management and marketing)

( ) Health Occupations

( ) Home Economics

( ) Trade and Industrial

( ) Service Occupation

( ) Technical

( ) Other (specify) _____

B. This questionnaire contains professional education competencies for community college and secondary school instructors. In relation to your job, you are asked to indicate your best judgement about the hierarchical level you consider NECESSARY for each competency.

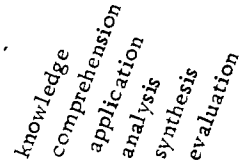
C. Do not take too much time in thinking about any particular item. Please do not leave out any item--there are no right or wrong answers. We are primarily concerned about your judgment regarding the level of competencies needed by vocational education instructors.

D. For each item please circle the rating (1, 2, 3, 4, 5, 6) which most closely represents YOUR JUDGMENT. If your judgment is not precisely represented by one of the choices, pick the one which comes closest. DO NOT LEAVE ANY BLANKS.

Here is an example:

Please read the fold-out before attempting to answer the question below.

Based on your teaching experience, what hierarchical level do you consider NECESSARY in your work as an instructor to:



1. develop objective tests to measure achievement — 1 2 3 4 5 (6)

This person, in marking the "6" rating, considered that his job required complete mastery of this activity.

INSTRUCTIONS: When answering the questions, if any doubt should arise regarding the interpretation of a definition, please direct your comments to the interviewer. He is with you for just that purpose.

REMEMBER: This is not a test. Refer frequently to the definitions on the green fold-out.

PROFESSIONAL EDUCATION COMPETENCIES QUESTIONNAIRE

Based on your teaching experience, what hierarchical level do you consider NECESSARY in your work as an instructor to:

		knowledge	comprehension	application	analysis	synthesis	evaluation
1.	assist (com col/sec sch) administrators initiate and maintain vocational programs	1	2	3	4	5	6
2.	interpret the provisions of instructor tenure laws	1	2	3	4	5	6
3.	conduct a shop or laboratory demonstration for an individual student	1	2	3	4	5	6
4.	involve yourself in civic community activities not directly related to the school	1	2	3	4	5	6
5.	promote and teach adult vocational programs	1	2	3	4	5	6
6.	ask questions during classroom presentations or demonstrations to aid student learning	1	2	3	4	5	6
7.	adapt your appearance and apparel to acceptable standards for instructors	1	2	3	4	5	6
8.	interpret the innovative provisions of the Vocational Act as amended in 1968	1	2	3	4	5	6
9.	select appropriate equipment and supplies for instructional purposes	1	2	3	4	5	6
10.	arrange and conduct field trips	1	2	3	4	5	6
11.	interpret the goals and objectives of vocational education	1	2	3	4	5	6
12.	interpret the goals of general education	1	2	3	4	5	6
13.	provide practical shop or laboratory experiences to enhance classroom learning	1	2	3	4	5	6
14.	participate in the supervision of non-vocational extracurricular activities	1	2	3	4	5	6
15.	aid the student in obtaining job placement after training	1	2	3	4	5	6
16.	interpret the history of vocational education	1	2	3	4	5	6
17.	relate technological advances to laboratory and classroom instruction	1	2	3	4	5	6

Based on your teaching experience, what hierarchical level do you consider NECESSARY in your work as an instructor to:

	knowledge	comprehension	application	analysis	synthesis	evaluation
18. interpret state certification requirements for instructors	1	2	3	4	5	6
19. assist in the development of the total(community college/secondary school) program	1	2	3	4	5	6
20. prepare budgetary requests for vocational programs	1	2	3	4	5	6
21. locate available standardized tests	1	2	3	4	5	6
22. secure on-the-job training positions for students	1	2	3	4	5	6
23. interpret the state specifications and requirements for vocational facilities.	1	2	3	4	5	6
24. develop audio-visual materials for instructional purposes	1	2	3	4	5	6
25. interpret the philosophy of the comprehensive (community college/secondary school)	1	2	3	4	5	6
26. select appropriate audio-visual materials for instructional purposes	1	2	3	4	5	6
27. revise courses in accordance with current occupational trends	1	2	3	4	5	6
28. maintain student performance or progress records	1	2	3	4	5	6
29. adhere to the code of ethics adopted in your (community college/secondary school)	1	2	3	4	5	6
30. interpret the philosophy of the (com col/sec sch) in providing vocational programs for the student	1	2	3	4	5	6
31. select textbooks and instructional materials for the classroom, shop or laboratory	1	2	3	4	5	6
32. develop objective tests to measure achievement	1	2	3	4	5	6
33. motivate students in the classroom, shop or laboratory	1	2	3	4	5	6
34. interpret the legal liabilities of a teacher	1	2	3	4	5	6
35. direct, advise, or promote student participation in competitive events or youth organizations related to vocational education	1	2	3	4	5	6

Based on your teaching experience, what hierarchical level do you consider NECESSARY in your work as an instructor to:

	knowledge	comprehension	application	analysis	synthesis	evaluation
36. relate to students from different socio-economic backgrounds	1	2	3	4	5	6
37. utilize individualized instruction materials and techniques	1	2	3	4	5	6
38. relate the course of study to measurable performance objectives	1	2	3	4	5	6
39. interpret your vocational program to others	1	2	3	4	5	6
40. provide special training or assistance to disadvantaged and handicapped students	1	2	3	4	5	6
41. use the State Plan for Vocational Education in securing reimbursement for vocational programs	1	2	3	4	5	6
42. organize or work with local vocational advisory committee	1	2	3	4	5	6
43. interpret the history of education	1	2	3	4	5	6
44. build a display for instructional purposes	1	2	3	4	5	6
45. formulate your own educational philosophy	1	2	3	4	5	6
46. utilize state guidelines for curriculum planning	1	2	3	4	5	6
47. draw from personal avocational interests to enrich instruction	1	2	3	4	5	6
48. identify the similarities and differences between the goals of general and vocational education	1	2	3	4	5	6
49. develop classroom instruction based upon the individual needs of the learner	1	2	3	4	5	6
50. provide appropriate practice for development of basic skills	1	2	3	4	5	6
51. relate the vocational program to other instructional programs	1	2	3	4	5	6
52. interpret the objectives of vocational education to others	1	2	3	4	5	6
53. break down an occupation or job into its component parts for instructional or guidance purposes	1	2	3	4	5	6
54. write performance objectives	1	2	3	4	5	6

Based on your teaching experience, what hierarchical level do you consider NECESSARY in your work as an instructor to:

	knowledge	comprehension	application	analysis	synthesis	evaluation
55. conduct community surveys to improve instruction or plan programs	1	2	3	4	5	6
56. use the information contained in professional journals for personal improvement or improvement of instruction	1	2	3	4	5	6
57. assess the validity, reliability and difficulty of instructor-made tests	1	2	3	4	5	6
58. maintain a clean, orderly laboratory or classroom	1	2	3	4	5	6
59. teach at the student's level and rate of learning	1	2	3	4	5	6
60. utilize written shop, classroom, and laboratory equipment organizational plans	1	2	3	4	5	6
61. maintain student attention during classroom presentations or demonstrations	1	2	3	4	5	6
62. make a daily lesson plan	1	2	3	4	5	6
63. distinguish between two or more educational philosophies	1	2	3	4	5	6
64. maintain necessary report forms required by state or federal agencies	1	2	3	4	5	6
65. use a student-centered teaching style	1	2	3	4	5	6
66. identify students in need of counseling or guidance	1	2	3	4	5	6
67. participate in professional organizations related to your subject matter area	1	2	3	4	5	6
68. evaluate the effectiveness of a classroom or laboratory demonstration	1	2	3	4	5	6
69. use the results of standardized test scores for job placement	1	2	3	4	5	6
70. utilize the services of local and state vocational education agencies	1	2	3	4	5	6
71. use counseling techniques to help students solve personal and social problems	1	2	3	4	5	6

Based on your teaching experience, what hierarchical level do you consider NECESSARY in your work as an instructor to:

	knowledge	comprehension	application	analysis	synthesis	evaluation
72. summarize classroom presentations	1	2	3	4	5	6
73. aid students in entering educational or occupational training programs beyond the (com col/sec sch) level	1	2	3	4	5	6
74. develop performance tests to measure achievement	1	2	3	4	5	6
75. maintain discipline in the classroom, shop or laboratory	1	2	3	4	5	6
76. participate in outside trade, business, or professional organizations related to your subject matter area	1	2	3	4	5	6
77. lead a conference	1	2	3	4	5	6
78. develop student learning activities to facilitate instruction	1	2	3	4	5	6
79. communicate your ideas or point of view to other instructors or administrators	1	2	3	4	5	6
80. develop subjective tests to measure achievement	1	2	3	4	5	6
81. relate current events associated with your subject matter area to classroom instruction	1	2	3	4	5	6
82. inform students of the nature and requirements of specific occupations	1	2	3	4	5	6
83. interpret the socio-economic class structure of the local community in relation to students enrolled in vocational programs	1	2	3	4	5	6
84. identify acceptable community social behaviors for instructors	1	2	3	4	5	6
85. work cooperatively with people in the community	1	2	3	4	5	6
86. identify local community power structures and pressure groups	1	2	3	4	5	6
87. operate duplicating equipment	1	2	3	4	5	6
88. make use of available guidance and counseling services within the (community college/secondary school)	1	2	3	4	5	6

Based on your teaching experience, what hierarchical level do you consider NECESSARY in your work as an instructor to:

	knowledge	comprehension	application	analysis	synthesis	evaluation
89. interpret school policies	1	2	3	4	5	6
90. provide programs for the student with special needs	1	2	3	4	5	6
91. use programmed learning materials	1	2	3	4	5	6
92. write articles for news releases	1	2	3	4	5	6
93. be stimulating in your work as an instructor	1	2	3	4	5	6
94. conduct follow-up studies for purposes of determining effectiveness of instruction	1	2	3	4	5	6
95. evaluate teaching effectiveness by measuring student achievement	1	2	3	4	5	6
96. articulate your instructional program with other educational institutions or agencies	1	2	3	4	5	6
97. interpret safety rules and regulations to students	1	2	3	4	5	6
98. screen and select students for your program	1	2	3	4	5	6
99. coordinate and supervise cooperative work experience programs	1	2	3	4	5	6

- - - -

APPENDIX A

Center Fold-Out

USE THE FOLLOWING DEFINITIONS AS A GUIDE WHEN COMPLETING THE INSTRUCTOR QUESTIONNAIRE:

1. KNOWLEDGE - The ability to recall, recite, or enumerate material. In essence, what is required is information. To identify, tell, or state would define the knowledge level tasks.

2. COMPREHENSION - Communication orally or in writing. The ability to rewrite, edit, or extrapolate materials. Making verbal use of materials or ideas. Describing in your own words.

3. APPLICATION - The ability to apply concepts or ideas in new situations. To apply known guides or solutions to new events.

4. ANALYSIS - The ability to break down material into component parts. To identify how parts or elements relate to each other. To differentiate, to distinguish, or to compare elements.

5. SYNTHESIS - The process of working with pieces, parts or elements and arranging or combining them to form a whole. To formulate, combine, compose, or consolidate.

6. EVALUATION - The ability to make judgments about the value of materials and methods. Criteria for judgment may be your own or someone elses. To appraise, critique, or interpret meanings.

STOP! - The interviewer will now explain the hierarchical structure in more detail.

APPENDIX B

Condensed Version of the Taxonomy of Educational Objectives**

Cognitive Domain

KNOWLEDGE

1.00 KNOWLEDGE

Knowledge, as defined here, involves the recall of specifics and universals, the recall of methods and processes, or the recall of a pattern, structure, or setting. For measurement purposes, the recall situation involves little more than bringing to mind the appropriate material. Although some alternation of the material may be required, this is a relatively minor part of the task. The knowledge objectives emphasize most the psychological processes of remembering. The process of relating is also involved in that a knowledge test situation requires the organization and reorganization of a problem such that it will furnish the appropriate signals and cues for the information and knowledge the individual possesses. To use an analogy, if one thinks of the mind as a file, the problem in a knowledge test situation is that of finding in the problem or task the appropriate signals, cues, and clues which will most effectively bring out whatever knowledge is filed or stored.

1.10 KNOWLEDGE OF SPECIFICS

The recall of specific and isolable bits of information. The emphasis is on symbols with concrete referents. This material, which is at a very low level of abstraction, may be thought of as the elements from which more complex and abstract forms of knowledge are built.

1.11 KNOWLEDGE OF TERMINOLOGY

Knowledge of the referents for specific symbols (verbal and non-verbal). This may include knowledge of the most generally accepted symbol referent, knowledge of the variety of symbols which may be used for a single referent, or knowledge of the referent most appropriate to a given use of a symbol.

*To define technical terms by giving their attributes, properties, or relations.

*Familiarity with a large number of words in their common range of meanings.

---

*Illustrative educational objectives selected from the literature.

**Bloom, Benjamin S. (1956)

1.12 KNOWLEDGE OF SPECIFIC FACTS

Knowledge of dates, events, persons, places, etc. This may include very precise and specific information such as the specific date or exact magnitude of a phenomenon. It may also include approximate or relative information such as an approximate time period or the general order of magnitude of a phenomenon.

*The recall of major facts about particular cultures.
*The possession of a minimum knowledge about the organisms studied in the laboratory.

1.20 KNOWLEDGE OF WAYS AND MEANS OF DEALING WITH SPECIFICS

Knowledge of the ways of organizing, studying, judging, and criticizing. This includes the methods of inquiry, the chronological sequences, and the standards of judgment within a field as well as the patterns of organization through which the areas of the fields themselves are determined and internally organized. This knowledge is at an intermediate level of abstraction between specific knowledge on the one hand and knowledge of universals on the other. It does not so much demand the activity of the student in using the materials as it does a more passive awareness of their nature.

1.21 KNOWLEDGE OF CONVENTIONS

Knowledge of characteristic ways of treating and presenting ideas and phenomena. For purposes of communication and consistency, workers in a field employ usages, styles, practices, and forms which best suit their purposes and/or which appear to suit best the phenomena with which they deal. It should be recognized that although these forms and conventions are likely to be set up on arbitrary, accidental, or authoritative bases, they are retained because of the general agreement or concurrence of individuals concerned with the subject, phenomena, or problem.

*Familiarity with the forms and conventions of the major types of works, e.g., verse, plays, scientific papers, etc.
*To make pupils conscious of correct form and usage in speech and writing.

1.22 KNOWLEDGE OF TRENDS AND SEQUENCES

Knowledge of the processes, directions, and movements of phenomena with respect to time.

*Understanding of the continuity and development of American culture as exemplified in American life.
*Knowledge of the basic trends underlying the development of public assistance programs.

1.23 KNOWLEDGE OF CLASSIFICATION AND CATEGORIES

Knowledge of the classes, sets, divisions, and arrangements which are regarded as fundamental for a given subject field, purpose, argument, or problem.

*To recognize the area encompassed by various kinds of problems or materials.

*Becoming familiar with a arange of types of literature.

1.24 KNOWLEDGE OF CRITERIA

Knowledge of the criteria by which facts, principles, opinions, and conduct are tested or judged.

*Familiarity with criteria for judgment appropriate to the type of work and the purpose for which it is read.

*Knowledge of criteria for the evaluation of recreational activities.

1.25 KNOWLEDGE OF METHODOLOGY

Knowledge of the methods of inquiry, techniques, and procedures employed in a particular subject field as well as those employed in investigating particular problems and phenomena. The emphasis here is on the individuals's knowledge of the method rather than his ability to use the method.

*Knowledge of scientific methods for evaluating health concepts.

*The student shall know the methods of attack relevant to the kinds of problems of concern to the social sciences.

1.30 KNOWLEDGE OF THE UNIVERSALS AND ABSTRACTIONS IN A FIELD

Knowledge of the major schemes and patterns by which phenomena and ideas are organized. These are the large structures, theories, and generalizations which dominate a subject field or which are quite generally used in studying phenomena or solving problems. These are at the highest levels of abstraction and complexity.

1.31 KNOWLEDGE OF PRINCIPLES AND GENERALIZATIONS

Knowledge of particular abstractions which summarize observations of phenomena. These are the abstractions which are of value in explaining, describing, predicting, or in determining the most appropriate and relevant action or direction to be taken.

*Knowledge of the important principles by which our experience with biological phenomena is summarized.

*The recall or major generalizations about particular cultures.

1.32 KNOWLEDGE OF THEORIES AND STRUCTURES

Knowledge of the body of principles and generalizations together with their interrelations which present a clear, rounded, and systematic view of a complex phenomenon, problem, or field. These are the most abstract formulations, and they can be used to show the interrelation and organization of a great range of specifics.

*The recall of major theories about particular cultures.

*Knowledge of a relatively complete formulation of the theory of evolution.

INTELLECTUAL ABILITIES AND SKILLS

Abilities and skills refer to organized modes of operation and generalized techniques for dealing with materials and problems. The materials and problems may be of such a nature that little or no specialized and technical information is required. Such information as is required can be assumed to be part of the individual's general fund of knowledge. Other problems may require specialized and technical information at a rather high level such that specific knowledge and skill in dealing with the problem and the materials are required. The abilities and skills objectives emphasize the mental processes of organizing and reorganizing material to achieve a particular purpose. The materials may be given or remembered.

2.00 COMPREHENSION

This represents the lowest level of understanding. It refers to a type of understanding or apprehension such that the individual knows what is being communicated and can make use of the material or idea being communicated without necessarily relating it to other material or seeing its fullest implications.

2.10 TRANSLATION

Comprehension as evidenced by the care and accuracy with which the communication is paraphrased or rendered from one language or form of communication to another. Translation is judged on the basis of faithfulness and accuracy, that is, on the extent to which the material in the original communication is preserved although the form of the communication has been altered.

*The ability to understand non-literal statements (metaphor, symbolism, irony, exaggeration).

*Skill in translating mathematical verbal material into symbolic statements and vice versa.

2.20 INTERPRETATION

The explanation or summarization of a communication. Whereas translation involves an objective part-for-part rendering of a communication, interpretation involves a reordering, rearrangement, or a new view of the material.

*The ability to grasp the thought of the work as a whole at any desired level of generally.

*The ability to interpret various types of social data.

2.30 EXTRAPOLATION

The extension of trends or tendencies beyond the given date to determine implications, consequences, corollaries, effects, etc., which are in accordance with the conditions described in the original communication.

*The ability to deal with the conclusions of a work in terms of the immediate inference made from the explicit statements.

*Skill in predicting continuation of trends.

3.00 APPLICATION

The use of abstractions in particular and concrete situations. The abstractions may be in the form of general ideas, rules or procedures, or generalized methods. The abstractions may also be technical principles, ideas, and theories which must be remembered and applied.

*Application to the phenomena discussed in one paper of the scientific terms of concepts used in other papers.

*The ability to preduct the probable effect of a change in a factor on a biological situation previously at equilibrium.

4.00 ANALYSIS

The breakdown of a communication into its constituent elements or parts such that the relative hierarchy of ideas is made clear and/or the relations between the ideas expressed are made explicit. Such analyses are intended to clarify the communication, to indicate how the communicationtion is organized, and the way in which it manages to convey its effects, as well as its basis and arrangement.

4.10 ANALYSIS OF ELEMENTS

Identification of the elements included in a communication.

*The ability to recognize unstated assumptions.

*Skill in distinguishing facts from hypotheses.

4.20 ANALYSES OF RELATIONSHIPS

The connections and interactions between elements and parts of a communication.

*Ability to check the consistency of hypotheses with given information and assumptions.

*Skill in comprehending the interrelationships among the ideas in a passage.

4.30 ANALYSIS OF ORGANIZATIONAL PRINCIPLES

The organization, systematic arrangement, and structure which hold the communication together. This includes the "explicit" as well as "implicit" structure. It includes the bases, necessary arrangement, and the mechanics which make the communication a unit.

*The ability to recognize form and pattern in literary or artistic works as a means of understanding their meaning.

*Ability to recognize the general techniques used in persuasive materials, such as advertising, propaganda, etc.

5.00 SYNTHESIS

The putting together of elements and parts so as to form a whole. This involves the process of working with pieces, parts, elements, etc., and arranging and combining them in such a way as to constitute a pattern or structure not clearly there before.

5.10 PRODUCTION OF A UNIQUE COMMUNICATION

The development of a communication in which the writer or speaker attempts to convey ideas, feelings, and/or experiences to others.

*Skill in writing, using an excellent organization of ideas and statements.

*Ability to tell a personal experience effectively.

5.20 PRODUCTION OF A PLAN, OR PROPOSED SET OF OPERATIONS

The development of a plan of work or the proposal of a plan of operations. The plan should satisfy requirements of the task which may be given to the student or which he may develop for himself.

*Ability to propose ways of testing hypotheses.

*Ability to plan a unit of instruction for a particular teaching situation.

5.30 DERIVATION OF A SET OF ABSTRACT RELATIONS

The development of a set of abstract relations either to classify or explain particular data or phenomena, or the deductions of propositions and relations from a set of basic propositions or symbolic representations.

*Ability to formulate appropriate hypotheses based upon an analysis of factors involved, and to modify such hypotheses in the light of new factors and considerations.

*Ability to make mathematical discoveries and generalizations.

6.00 EVALUATION

Judgments about the value of material and methods for given purposes. Quantitative and qualitative judgments about the extent to which material and methods satisfy criteria. Use of a standard of appraisal. The criteria may be those determined by the student or those which are given to him.

6.10 JUDGMENTS IN TERMS OF INTERNAL EVIDENCE

Evaluation of the accuracy of a communication from such evidence as logical accuracy, consistency, and other internal criteria.

*Judging by internal standards, the ability to assess general probability of accuracy in reporting facts from the care given to exactness of statement, documentation, proof, etc.

*The ability to indicate logical fallacies in arguments.

6.20 JUDGMENTS IN TERMS OF EXTERNAL CRITERIA

Evaluation of material with reference to selected or remembered criteria.

*The comparison of major theories, generalizations, and facts about particular cultures.

*Judging by external standards, the ability to compare a work with the highest known standards in its field--especially with other works of recognized excellence.

APPENDIX C

Letter to Community Colleges and Secondary School Administrators

Dear Mr.

Research is currently underway at Oregon State University to determine the levels of professional competencies needed by community college and secondary school vocational education instructors. This effort represents one of several steps in a comprehensive plan to develop a performance based curriculum at the university level. Milwaukie High School has been chosen as one of the local schools from which we are seeking to draw appropriate information.

Enclosed you will find a copy of the instrument to be used in the study. Its design and content requires a personal presentation to selected vocational education instructors. Our field study indicates that 35 minutes per respondent is more than adequate for a review of the instructions and completing the instrument.

As principal, you will play a very important part in this project, and we would greatly appreciate the willingness of your school to participate. We are seeking the best possible responses to the items in the instrument, and are therefore asking cooperating principals, based on the following criteria, to select the four (4) most effective instructors on their vocational education staff. The instructional area is not important.

CRITERIA

A. Knowledge and organization of subject matter.
B. Adequacy of relations with students in class.
C. Adequacy of plans and procedures in class.
D. Enthusiasm in working with students.

Instructors selected by you will be contacted personally, and asked individually to participate. Please be assured we will respect your confidence regarding those named. Individual responses to the questionnaire will not be reported by name or school affiliation. If you are unable to recommend four instructors, please suggest as many as you can.

Appendix C (Continued)

Enclosed is a self-addressed response card to indicate your willingness to participate. If your answer is affirmative, you will be asked to send the names of your suggested respondents in an envelope to be supplied by us. We shall be looking forward to hearing from you at your earliest convenience.

Thank you,

Dr. Henry TenPas, Director
Division of Vocational, Adult, and
Community College Education

HAT:mlo

Encl.

RESPONSE CARD

NAME OF SELECTED SCHOOL

Please check one and return within (3) days.

☐ I WISH TO PARTICIPATE IN THE STUDY

☐ I DO NOT WISH TO PARTICIPATE IN THE STUDY

Signature of Principal/Deans of Instruction

APPENDIX D

Letter From Participating Administrators Listing Respondents' Names and Teaching Areas

Thank you for your willingness to participate in our study which will help to identify needed professional education competencies of vocational educators. The responses from your staff will play an important part in determining the direction of vocational teacher preparation at Oregon State University for many years to come.

Since we are seeking the best possible responses to the items in the test instrument, please select and list the four (4) most effective instructors on your vocational education staff in the spaces below. Selected instructors must be from your regular vocational education programs. Each instructor will be personally contacted in the near future. After you have listed the instructors, please insert this letter in the self-addressed, stamped envelope and return within three (3) days.

CRITERIA FOR SELECTION OF STAFF

A. Knowledge and organization of subject matter.

B. Adequacy of relations with students in class.

C. Adequacy of plans and procedures in class.

D. Enthusiasm in working with students.

RECOMMENDED RESPONDENTS	VOCATIONAL AREA
1. _____	_____
2. _____	_____
3. _____	_____
4. _____	_____

Thank you,

Richard L. Spaziani
Division of Vocational, Adult,
and Community College Education

APPENDIX E

Letter Sent to Selected Respondents

Research is currently underway at Oregon State University to determine the levels of professional competencies needed by community college and secondary school vocational education instructors. Your school has been selected to participate in this important study. As a vocational educator, you have been one of several especially designated to represent your school. The administration of your school as well as the appropriate state agency have been contacted, and give their support to this research. The data that only you can provide will have significant implications for vocational teacher preparation for many years to come.

We are aware of the demands on your time, and are very appreciative of your professional assistance. You are being asked to help us by completing a research instrument which, by its nature and content, requires personal presentation to you as a study respondent. The instrument is not a test, but only a means for seeking your professional opinion concerning broadly stated competencies of vocational educators. Our field study indicates that 35 minutes is more than adequate for a review of the instructions and completing the instrument. Individual responses to the questionnaire will not be reported by name, school affiliation, or geographical location. A copy of the final results will be made available to each participating school.

I will personally administer the research questionnaire and review the instructions with you. However, under no circumstances do I wish to interfere with the conduct of your classes or school business. Because it will be difficult to make individual appointments in advance, I plan to spend the entire day at your school on , and at your convenience, either during the day or after school, administer the questionnaire.

Cordially,

Richard L. Spaziani
Division of Vocational, Adult and
Community College Education
Telephone: 754-2961

RLS:mlo

APPENDIX F

Instructional Aid Used During Presentation
of Instructor Questionnaire

MAJOR CATEGORIES IN THE COGNITIVE DOMAIN*	ILLUSTRATIVE GENERAL INSTRUCTIONAL OBJECTIVES	ILLUSTRATIVE BEHAVIORAL TERMS FOR STATING SPECIFIC LEARNING OUTCOMES
1. KNOWLEDGE. Knowledge is defined as the remembering of previously learned material. This may involve the recall of a wide range of material, from specific facts to complete theories. All that is required is the bringing to mind of the appropriate information.	Knows common terms Knows specific facts Knows methods and procedures Knows basic concepts Knows principles	Defines, describes, identifies, labels, lists, matches, names, outlines, reproduces, selects, states.
2. COMPREHENSION. Comprehension is defined as the ability to grasp the meaning of material. This may be shown by translating material from one form to another; by interpreting materials; and by estimating future trends. Comprehension goes beyond the simple remembering of material.	Understands facts and principles Interprets verbal material Interprets charts and graphs Translates verbal material into mathematical formulas Estimates future consequences implied in data Justifies methods and procedures	Converts, defends, distinguishes, estimates, explains, extends, generalizes, gives examples, infers, paraphrases, predicts, rewrites, summarizes.

3. APPLICATION. Application refers to the ability to use learned material in new and concrete situations. This may include the application of such things as rules, methods, concepts, principles, laws, and theories. Learning outcomes in this area require a higher level of understanding than those under comprehension.	Applies concepts and principles to new situations Applies laws and theories to practical situations Solves mathematical problems Constructs charts and graphs Demonstrates correct usage of a method or procedure	Changes, computes, demonstrates, discovers, manipulates, modifies, operates, predicts, prepared, produces, relates, shows, solves, uses.
4. ANALYSIS. Analysis refers to the ability to break down material into its component parts so that its organizational structure may be understood. This may include the identification of the parts, analysis of the relationships between parts, and recognition of the organizational principles involved. Analysis requires an understanding of both the content and the structural form of the material.	Recognizes unstated assumptions Recognizes logical fallacies in reasoning Distinguishes between facts and inferences Evaluates the relevancy of data Analyzes the organizational structure of a work (art, music, writing, etc)	Breaks down, diagrams, differentiates, discriminates, distinguishes, identifies, illustrative, infers, outlines, points out, relates, selects, separates, subdivides.
5. SYNTHESIS. Synthesis refers to the ability to put parts together to form a new whole. This may involve the production of a unique communication, a plan of operations, or a set of abstract relations. Learning outcomes in this area stress creative behaviors, with major emphasis on the formulation of new patterns or structures.	Writes a well organized theme Gives a well organized speech Writes a creative short story Proposes a plan for an experiment Integrates learning from different areas into a plan for solving a problem Formulates a new scheme for classifying objects	Categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, writes.

6. EVALUATION. Evaluation is concerned with the ability to judge the value of material for a given purpose. The judgments are to be based on a definite criteria. Evaluation prepresents the highest in the cognitive hierarchy because they contain elements of all the other categories, plus conscious value judgments based on clearly defined criteria.	Judges the logical consistency of written material Judges the adequacy with which conclusions are supported by data Judges the value of a work (art, music, writing) by the use of internal criteria Judges the value of a work (art, music, writing) by the use of external standards of excellence	Appraises, compares, concludes, contrasts, criticizes, describes, discriminates, explains, justifies, interprets, relates, summarizes, supports.

*Source: Gronlund, Norman E. (1970), p. 20-21.

APPENDIX G

The Median Test*

Competency #1:	Community College n_1 Domain Level	Responses	Secondary School n_2 Domain Level	Responses	$\frac{N}{2} = 47$ Combined Frequency (Responses	Domain level (Median)
	6	25	6	28	53	5.613
	5	9	5	3	12	
	4	6	4	5	11	
	3	7	3	10	17	
	2	-	2	1	1	
	1	-	1	-	-	

	C/C	S/S	
	A 25	B 28	Response above the median
	C 22	D 19	Responses at the median and below

$$\chi^2 = \frac{N\left(\left|AD-BC\right| - \frac{N}{2}\right)^2}{(A+B)C+D)(A+C)(B+D)}$$

$$= \frac{94\left(\left|(25)(19) - (28)(22)\right| - \frac{94}{2}\right)^2}{(53)(41)(47)(47)}$$

$$= \frac{94\left(\left|(475) - (616)\right| = 141 - 47\right)^2}{94 = (8836)}$$

$$= \frac{830584}{4800157} = .0173$$

$$= .0173 \leq 3.841 = \text{Retain null hypothesis}$$

Summary of Procedures

1. Determine the combined median of the $n_1 + n_2$ scores.
2. Split each group's score at that combined media. Enter the resultant frequencies in the 2 X 2 table. If many scores fall at the combined median, split the scores into these categories: those which exceed the median and those which do not.
3. Find the probability of the observed values.

APPENDIX H

Results of Chi-square Analysis Using the Median Test*

Competency number	Computed value	Null Hypothesis	Competency number	Computed value	Null Hypothesis
1	.017	Retain	27	.000	Retain
2	.044	"	28	2.086	"
3	.045	"	29	1.064	"
4	.019	"	30	.039	"
5	.000	"	31	1.223	"
6	.000	"	32	.046	"
7	.618	"	33	.087	"
8	.083	"	34	.000	"
9	2.478	"	35	1.061	"
10	.068	"	36	1.800	"
11	3.460	"	37	.071	"
12	.024	"	38	.000	"
13	.000	"	39	1.087	"
14	2.769	"	40	.038	"
15	4.263	Reject**	41	.015	"
16	2.321	Retain	42	.000	"
17	.000	"	43	.000	"
18	.000	"	44	.069	"
19	4.286	Reject**	45	.064	"
20	1.557	Retain	46	.000	"
21	.017	"	47	.002	"
22	1.076	"	48	.017	"
23	2.205	"	49	.018	"
24	.000	"	50	1.080	"
25	.000	"	51	2.086	"
26	.000	"	52	1.543	"

Competency number	Computed value	Null Hypothesis	Competency number	Computed value	Null Hypothesis
53	.043	Retain	81	1.151	Retain
54	.039	"	82	1.087	"
55	.000	"	83	1.064	"
56	2.108	"	84	.000	"
57	.042	"	85	1.088	"
58	.017	"	86	.000	"
59	.048	"	87	.000	"
60	.000	"	88	.000	"
61	.069	"	89	.017	"
62	.000	"	90	.000	"
63	.017	"	91	.070	"
64	.000	"	92	1.400	"
65	1.543	"	93	2.132	"
66	1.919	"	94	.017	"
67	3.507	"	95	.068	"
68	1.820	"	96	1.068	"
69	1.125	"	97	.043	"
70	.000	"	98	.000	"
71	.000	"	99	.0713	"
72	.000	"			
73	.000	"			
74	.000	"			
75	.022	"			
76	2.728	"			
77	1.064	"			
78	.038	"			
79	.037	"			
80	1.557	"			

* The significance level for testing the null hypothesis was set at .05 with the degrees of freedom equal to 1.

** The data being hierarchical in nature precludes the application of additional statistical tests.

APPENDIX I

Coding of Data Cards

A) Card 1

Column	
1-3	A03 to A04. Represents one of the 94 instructors used in the study.
4-5	1 to 25 represents one of the community colleges or secondary schools.
6	1 to 8. Represents one of the eight subject matter areas in which the respondents taught.
7	1. Data card number one.
8-80	Data. Response values of 1,2,3,4,5, and 6 which were assigned to the 73 competencies contained in the card.

B) Card 2

Column	
1-7	Same as above.
8	2. Data card number two.
9-26	Data. Response values of 1,2,3,4,5, and 6 which were assigned to the 26 competencies contained in the card.

APPENDIX J

Q-Mode Data Control Cards

```
7
8 JOB, 708090,SPAZ, DICK SPAZIANI
7
8TIME=1000
7
8MFBLKS=500
7
8COPY, O=80
*GO
*DATA,TRANS,CARDS=2,ITEMS=99.
*CORR,QMODE,DIAG=ONE,OUTPUT.
*FACTOR,NUMFAC=4,EIGEN,OUTPUT.
*ROTATE,VARI,NONSTD,OUTPUT.
*TITLE BLOOM'S TAXONOMY
*LABEL,A01$A02$A03$ .....A18$
A19$ .....A38$
A39$ .....A58$
A59$ .....A78$
A79$ .....A94$.
*FORMAT (7X,73F1.0, 7X,26F1.0)
*END
Data cards inserted here
**
7
8
7
8REWIND,80
7
8*FAST
7
8LOGOFF
```

APPENDIX K

R-Mode Data Control Cards

```
7
8 JOB, 708090,SPAZ, DICK SPAZIANI
7
8TIME=1000
7
8MFBLKS=500
7
8COPY, O=80
*GO
*DATA,CARDS=2,ITEMS=99.
*CORR,RMODE,DIAG=ONE,PRINTOUT=BOTH,OUTPUT.
*FACTOR,NUMFAC=5,EIGEN,OUTPUT.
*ROTATE,VARI,NONSTD,OUTPUT.
*TITLE BLOOM'S TAXONOMY
*LABEL,S01$S02$S03$ .....S18$
S19$ .....S38$
S39$ .....S58$
S59$ .....S78$
S79$ .....S98$
S99$.
*FORMAT(7X,73F1.0, 7X,26F1.0)
*END
Data cards inserted here
**
77
88
7
8REWIND,80
7
8*FAST
7
8LOGOFF
```

APPENDIX L

Results of Q-Mode Analysis

Respondent number	Factor loading	Respondent number	Factor loading	Respondent number	Factor loading
01	.967	33	.944	65	.940
02	.965	34	.947	66	.949
03	.920	35	.961	67	.958
04	.962	36	.938	68	.926
05	.979	37	.943	69	.961
06	.958	38	.976	70	.961
07	.978	39	.951	71	.943
08	.973	40	.950	72	.952
09	.955	41	.949	73	.940
10	.932	42	.961	74	.956
11	.961	43	.968	75	.971
12	.956	44	.949	76	.915
13	.926	45	.972	77	.919
14	.941	46	.960	78	.924
15	.954	47	.961	79	.950
16	.940	48	.928	80	.920
17	.982	49	.943	81	.926
18	.952	50	.963	82	.932
19	.940	51	.958	83	.952
20	.965	52	.962	84	.954
21	.920	53	.951	85	.952
22	.951	54	.960	86	.962
23	.951	55	.942	87	.960
24	.965	56	.931	88	.952
25	.953	57	.943	89	.982
26	.938	58	.972	90	.964
27	.939	59	.971	91	.946
28	.923	60	.953	92	.935
29	.917	61	.964	93	.932
30	.962	62	.968	94	.973
31	.944	63	.966		
32	.925	64	.954		

APPENDIX M

Results of R-Mode Analysis

Five-Factor

Illustrative Sample

	FACTORS				
VARIABLES	1	2	3	4	5
01	-0.41996	.02267	.13785	.25104	-0.11287
02	-0.41382	.29390	.01310	.14593	.10171
03	.15504	-0.44394	.21866	.24475	.28493
04	-0.13340	.08417	.41017	-0.09534	.02146
05	-0.09226	.14544	.17654	.44010	-0.18037
06	.00084	-0.41337	.13135	.39751	.16523
07	-0.09146	.00784	.52789	.11092	.16948
08	-0.60765	.02363	.10857	.13534	.17297
09	.18957	-0.44683	.15308	.16004	.27850
10	-0.16460	-0.38757	.12371	.22369	.08723
11	-0.23555	.19205	-0.03060	.47915	.04832
12	-0.52317	.16579	-0.01939	.26509	.28015
13	.00947	-0.52911	.21973	.27137	.17363
14	-0.37044	.03454	.27443	.04791	.31374
15	-0.27143	-0.01574	.41731	.21731	-0.02890
16	-0.52330	.08347	.28598	.22514	.11038
17	-0.30439	-0.39766	.27206	.14515	-0.07474
18	-0.53657	-0.04801	.11880	-0.04712	.12512
19	-0.60232	.01693	-0.13026	.00136	.11256
20	-0.16920	-0.13585	.17300	.00088	.13791
21	-0.19059	-0.16537	.22645	.22550	.01329
22	-0.39685	-0.28102	.14258	.11727	-0.31525
23	-0.61450	-0.05395	.13780	.03080	.13541
24	-0.21414	-0.14504	.15267	.55901	.33675
25	-0.63342	.01199	.16296	.28007	.05289
26	-0.01275	-0.29006	.37426	.41503	.19051
27	-0.24520	-0.33660	.07176	.33495	-0.13152
28	-0.12162	-0.01163	.41275	.34970	.08634
29	-0.11594	.08375	.74678	.06370	.08457
30	-0.52354	.08953	.22426	.30931	-0.11909

APPENDIX N

Oregon Community Colleges Participating in the Study

1. Blue Mountain Community College
   2411 Carden Avenue N.W.
   Pendleton, Oregon 97801

2. Central Oregon Community College
   College Way
   Bend, Oregon 97701

3. Chemeketa Community College
   4389 Satter Drive N.E.
   Salem, Oregon 97303

4. Clackamas Community College
   19600 S. Molalla Avenue
   Oregon City, Oregon 97045

5. Clatsop Community College
   16th and Jerome
   Astoria, Oregon 97405

6. Lane Community College
   4000 East 30th Avenue
   Eugene, Oregon 97405

7. Linn-Benton Community College
   Box 249
   Albany, Oregon 97321

8. Mt. Hood Community College
   26000 SE Stark
   Gresham, Oregon 97030

9. Portland Community College
   12000 S.W. 49th Avenue
   Portland, Oregon 97219

10. Southwestern Community College
    Coos Bay, Oregon 97420

11. Treasure Valley Community College
    650 College Boulevard
    Ontario, Oregon 97914

12. Umpqua Community College
    Box 967
    Roseburg, Oregon 97470

APPENDIX O

Oregon Secondary Schools
Participating in the Study

13. Astoria Senior High School
1001 W. Marine Drive
Astoria, Oregon 97103

14. Clackamas High School
13801 S.E. Webster Rd.
Milwaukie, Oregon 97222

15. Estacada Union High School
350 N.W. 7th
Estacada, Oregon 07023

16. Forest Grove High School
1341 Pacific Ave.
Forest Grove, Oregon 97116

17. Gervais High School
Gervais, Oregon 97026

18. Hood River Valley High School
Rt. 4, Box 270
Hood River, Oregon 97301

19. Junction City High School
1135 West 6th
Junction City, Oregon 97448

20. Newport High School
322 N.E. Eads
Newport, Oregon 97365

21. Ontario High School
1115 W. Idaho Avenue
Ontario, Oregon 97914

22. Riddle High School
Riddle, Oregon 97469

23. McNary High School
505 Sandy Drive, N
Salem, Oregon 97303

24. Springfield High School
Springfield, Oregon 97477

25. Cascade Union High School
Rt. 1
Turner, Oregon 97329