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Title: THE PERCEPTION OF ATTITUDES BY SELECTED COMMUNITY COLLEGE TEACHERS AND ADMINISTRATORS: A MULTIDIMENSIONALLY SCALED ANALYSIS

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Purpose of the Study

The purpose of the study was to determine whether multidimensional scaling analysis could be applied to a set of perceived attitude relationships of selected community college personnel. The questions to be answered were:

1. Could perceived attitude relationships regarding the concepts of academic freedom, academic rank, collective bargaining, merit pay, teacher evaluation, and tenure be adequately represented in dimensional terms?
2. What was the nature of the relevant dimensions regarding these perceived attitudes?
3. Were the perceived attitude relationships regarding the

above concepts different for administrators, academic (LDC) teachers, and vocational/technical teachers?

4. Were there significant differences between community college personnel in their preference for the above concepts?
5. Could qualitative correlations be established between perceived attitude relationships and preferences for the above concepts among the various community college personnel?

Procedures

Data for the study were gathered by means of a questionnaire which paired the six educational concepts, using the method of successive intervals, in order to provide the dissimilarities information needed for the multidimensional scaling routine. In addition, preference scores were obtained regarding the six concepts.

The questionnaire was administered to a sample of 27 administrators, 27 academic teachers, and 27 vocational/technical teachers employed by Portland Community College in Portland, Oregon. The respondents were asked to 1) imagine a community college teacher who strongly agrees with a given concept and then indicate the extent of this teacher's agreement or disagreement with a paired concept, and 2) to indicate their degree of preference for each concept.

The data were analyzed at the Oregon State University Computer Center using TORSCA - 9, a nonmetric computer program for

multidimensional scaling, and one-way analysis of variance. Additional transformations of the data were done on a computer terminal at Portland Community College.

The concept spaces established by each group of community college personnel were presented as two-dimensional mappings. Furthermore, combined concept spaces were mapped to facilitate comparisons made between groups.

The preference scores for each group of community college personnel were averaged (by educational concept) and listed in table form along with the corresponding F values.

Selected Findings

All three concept spaces, as perceived by the Portland Community College personnel, were adequately represented in two dimensions using multidimensional scaling analysis. Kruskal's stress--the measure of how well the six educational concepts "fit" into two-dimensional space-- was 0.014, 0.002, and 0.000 for the administrators, academic teachers, and vocational/technical teachers respectively.

All three groups of personnel perceived the concept space as being structured in the same basic manner. The concepts of merit pay and collective bargaining anchored one dimension which was labeled economic methodology. The concepts of academic

freedom/tenure and teacher evaluation formed a second oblique dimension which was labeled academic traditionalism. The angle between these dimensions was 41^{o}, which indicated a perceived similarity between the concepts of academic freedom/tenure and collective bargaining in the first quadrant, and merit pay and teacher evaluation in the third quadrant.

The F tests, which contrasted all three mean scores for concept preference (one concept at a time), revealed that significant differences existed among the community college personnel for every concept. In general, the administrators and vocational/technical teachers were in close agreement in their preference scores for the six educational concepts. Furthermore, both of these groups differed significantly with the academic teachers regarding their preference scores for these same concepts.

The Perception of Attitudes by Selected Community College Teachers and Administrators: A Multidimensionally Scaled Analysis

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I. INTRODUCTION

Background of the Problem

At this point in time, most techniques for measuring attitudinal judgments use scales which are unidimensional. These scales consist of a single continuum of opinions or attitudes that range between an upper and lower bound. These boundaries may be defined by a "strongly favor" on one end to a "strongly oppose" on the other. Examples of such one-dimensional techniques are Thurstone scales (Thurstone and Chave, 1939), Likert (1932) scales, paired-comparison scales (Thurstone, 1927), successive intervals scales (Saffir, 1937), and Guttman (1947) scales. All of these scales are unidimensional and can measure one variable, and one variable only. However, the attitude items may be related in a multidimensional manner.

The fact that attitudes about related items are often too complex to scale unidimensionally led the way for a modern technique called multidimensional scaling. This method (MDS) allowed the multidimensional nature of the related attitude items or stimuli to emerge, instead of being lost on a unidimensional scale by choice of items and by analytical technique. In fact, early analysis without the modern

digital computer would have prohibited the use of MDS due to the complex nature of the technique.

Although the use of MDS for scaling attitudes was pioneered by Abelson (1954) in the mid-1950's, educators have continued to rely chiefly on Likert scales for attitude assessment. Recent applications of MDS to classroom learning by Wainer and Berg (1972) in the field of literature and by Evanechko and Maguire (1972) in the study of increased semantic competence in children have not advanced the use of this methodology to attitude scaling in education.

Besides the need to apply MDS to the complex issues in education in general, and the resulting attitudes and opinions, there is a specific need to investigate attitudes of community college personnel. Blocker, Plummer, and Richardson (1965) have charged that ". . . there is a dearth of substantive information about the attitudes and morale of instructors in two-year colleges" (p. 157).

Statement of the Problem

The primary purpose of the present study was to investigate whether a set of perceived attitude relationships regarding the following concepts: 1) academic freedom, 2) academic rank, 3) collective bargaining, 4) merit pay, 5) teacher evaluation, and 6) tenure could be adequately represented in dimensional terms. And if they could be, to determine the nature of the relevant dimensions involved. A

secondary purpose was to investigate responses made by three diverse groups of community college personnel to determine if they perceived attitudes regarding the above concepts as being structured in different ways.

Objectives

The main objective of the study was to determine whether multidimensional scaling analysis could be applied to a set of perceived attitude relationships of selected community college personnel. The questions to be answered were:

1. Could perceived attitude relationships regarding the concepts of academic freedom, academic rank, collective bargaining, merit pay, teacher evaluation, and tenure be adequately represented in dimensional terms?
2. What was the nature of the relevant dimensions regarding these perceived attitudes?
3. Were the perceived attitude relationships regarding the above concepts different for administrators, academic (LDC) teachers, and vocational/technical teachers?
4. Were there significant differences between community college personnel in their preference for the above concepts?
5. Could qualitative correlations be established between

perceived attitude relationships and preferences for the above concepts among the various community college personnel?

Hypotheses

Responses of the three groups of community college personnel were tested for significant differences using the preference data. The null hypotheses tested were: There are no significant differences between the preferences of administrators, academic teachers, and vocational/technical teachers for 1) academic freedom, 2) academic rank, 3) collective bargaining, 4) merit pay, 5) teacher evaluation, and 6) tenure.

Assumptions of the Study

Research in the study was based on the following assumptions:

1. Respondents - All respondents in the study volunteered their services and indicated only the department in which they taught or administered. It is assumed no coercion was present.
2. Responses - All responses made by the participants in the study were stated preferences and perceptions. In the present study, as in all studies of this nature, it is assumed that the results are as valid as the responses.

3. Analysis - Multidimensionally scaled data were analyzed in a qualitative manner using graphs. An underlying assumption of the MDS instrument is that its main value stems from its ability to graphically portray relationships among data.

Importance of the Study

The importance of the study was documented in two general areas of concern. The first area pertained to the need for attitude assessment of community college personnel and the relationship these attitudes have to the community college mission. The second area--the one central to the purpose of the study--pertained to the need for improved methodology in the field of attitude scaling in education.

When attempting to assess and scale attitudes of community college personnel, it is imperative that differences between personnel be preserved. Blocker et al. (1965), when referring to these differences, put the importance of the matter into perspective by stating:

> There is a clear-cut distinction between the liberal and conservative approaches to the faculty of the two-year college. Probably no other problem is causing more delay in the rapid development of the two-year college . . . (p. 134).

Medsker and Tillery (1971) also referred to the importance of the study of attitudes relative to community college development by stating ". . . if the staff [attitudes are] not in harmony with the expectations

held for the community college, those expectations may not be realized" (p. 91).

Besides the impact of the community college personnel upon the mission of the college, many teachers may feel frustrated by the community college environment. O'Banion (1972) believes that "Many community-junior college faculty do not have the attitudes. . . that would aid their adjustment to the 'teaching college' " (p. 60). Some teachers may not care for the comprehensive nature of the community college. A study by Medsker (1960) indicated that academic teachers were less inclined than administrators or vocational/technical teachers to approve of comprehensive community-junior college programs. Because of the large number of students in the vocational and technical programs, faculty attitudes must be considered when administering a comprehensive community college. As Blocker et al. (1965) noted:

> . . . Faculty attitudes conform to their personal need for status and recognition as members of the academic community, but such a point of view does not contribute solutions to the problem of educating larger and larger numbers of students (p. 134).

Other studies further indicate the divergence of attitudes among community college personnel. Kimball (1960), when analyzing 14 public community colleges in Michigan, uncovered numerous contrasts between the attitudes of administrators and faculty members toward the community college and its purpose. Kelly and

Connolly (1970), when relating attitudes to prior work experience, made the following generalization:

> Faculty from various sources can be typed according to their attitude and their demonstrated commitment to the two-year college. Future research may more clearly reveal differences that cannot be ignored, but a generalization can be made now: attitudes toward and commitment to the junior college as a place to work are tempered by previous occupational experience (p. 11).

Other studies appear to indict many community college faculty members as not being in favor of the comprehensive "people's college." For instance, Friedman's (1967) study showed that a faculty member's acceptance or nonacceptance of the community-junior college was related to the "academic" nature of his teaching role.

Many of the above cited studies seem to indicate the importance of two ideas related to attitudes of community college personnel: 1) attitudes not only affect their individual growth, but the growth of the college as well, and 2) attitudes and commitments vary considerably toward the community college and its purpose.

Although the importance of attitudes, on the part of community college personnel, cannot be overstated, most scaling techniques currently used in attitude assessment were developed in the late 1920's and early 1930's. At that time, Likert (1932) demonstrated that the simple method of scoring in arbitrary units (1 to 5) could yield results as reliable as the Thurstone-Chave (1929) equal-appearing interval scale. However, because many of the issues

within education and the community college in particular are tremendously complex and interrelated, it seems reasonable to expect that attitudes regarding these issues are also complex and interrelated. In short, the Likert scale, which is unidimensional, may be inadequate to scale attitudes which are very likely to be multidimensional in nature.

Attitude scaling, using MDS, was pioneered in 1954 by Abelson. At that time he noted the problem with using:

> . . . one-dimensional techniques [such as the] Thurstone scales, Likert scales, paired comparison scales, successive intervals scales, and Guttman scales. . . [when] the property of one-dimensionality has been forced on the scale by the choice of items and by the analytical method and by no means necessarily represents the dimensionality of the set of all commonly held attitudes in the domain (p. 405).

Messick (1956) also referred to the importance of MDS as an attitude scaling technique when he observed:

> The actual attitude arrangements perceived by individuals. . . has seldom been investigated, mainly because of a lack of appropriate methods. Knowledge of the ways in which individuals perceive attitudes as being structured in others is important psychologically, since such perceptions affect an individual's understanding of others, his relationships and adjustments with others, and his actions toward others. It might be possible to obtain some information about these perceived attitude structures by utilizing multidimensional scaling techniques (p. 59).

In summary, the importance of the present study rested on determining whether MDS could be applied to a set of perceived attitude relationships of community college personnel regarding

important concepts affecting themselves and the college. Of additional importance was the increased understanding of the differences between community college personnel. Tucker (1964) related this increased understanding to decision-making when he said that ". . . knowledge of the structure of individual differences . . . should be important to the use of human judgements in optimal decisions" (p. 86).

II. REVIEW OF LITERATURE

The present study investigated the application of multidimensional scaling to a set of perceived attitude structures of community college personnel regarding academic freedom, academic rank, collective bargaining, merit pay, teacher evaluation, and tenure. Literature that was reviewed, related to the above investigation, was divided into four main sections:

1. Literature related to attitude measurement
2. Literature discussing multidimensional scaling theory
3. Studies relating the application of MDS to attitude measurement
4. Literature pertaining to attitudes of community college personnel.

Literature Related to Attitude Measurement

Literature related to the field of attitude measurement is vast and complex. However, it was important to include this section to provide a background and contrast to MDS as an attitude measurement technique. In most cases, studies included in this section are considered classic investigations of attitude measurement and scaling. This section consists of the following:

1. Literature involving classic direct attitude tests

2. Literature related to alternative attitude tests.

Classic Direct Attitude Tests

The historic movement of measuring attitudes can be traced to the late 1920's and early 1930's. Useful procedures in constructing psychophysical (rational) attitude measurement scales were first offered by Thurstone-Chave (1929) in their equal-appearing interval scale. In this scale, the universe of attitude items is considered to be an ordered set. However, this scale is cumbersome and includes the following steps:

1. Specify the attitude variable to be measured.
2. Collect a wide variety of opinions relating to it, from newspapers, books, or from individuals.
3. Assemble on cards approximately 100 such typical opinions.
4. Require at least 200-300 judges to sort these cards into piles (11 being a commonly employed number), each pile representing equidistant degrees of the attitude according to each judge's estimation.
5. Calculate the scale value for each of the items by computing the median of the scale values assigned to it by the judges, and the dispersion of the judgments around the median.
6. Retain such statements as have small dispersions, and are on the whole equally spaced. Give approximately equal representation to each of the intervals secured.

7. In applying this scale, have the respondent check every statement with which he agrees; his score is the mean scale-value for all the statements he has endorsed.

In conclusion, although construction of an equal-appearing scale was aided to some extent by Droba (1932) and Wang (1932), when they offered suggestions for uniform wording as an aid to writing attitude statements, this scale is still time-consuming to develop and administer.

In 1932, a new and simpler method of constructing attitude scales was introduced by Likert (1932). He demonstrated that the technique of scoring in arbitrary units (1 to 5), when applied to rational scales, could yield results as reliable as the psychophysical scores. This technique, commonly referred to as the Likert scale, is the summated rating scale. The data collection procedure, using the method of summated ratings, begins with the solicitation of responses to a battery of multiple-choice items. For each item, a typical questionnaire has an ordered set of response alternatives ranging between "strongly disagree" and "strongly agree"--representing numerical values of -2 and +2 respectively. Respondents select the alternative that best describes their attitude toward the item in question.

The quantitative analysis of responses to a summated rating scale is relatively simple. The measurement of each variable is

treated as a separate, independent process. The investigator determines a priori, for each variable, those items which collectively describe the variable in question. The respondent is then scored on each item in the set. A respondent's score on any item is merely the scale value of the response alternative he selected.

After all respondents have been scored on the variable under consideration, the item scores are correlated with the summary score. Items which fail to correlate at some acceptable level are eliminated and a new summary score is computed. This process is then repeated until the remaining items display an acceptable degree of covariation with the summary score. By employing this process of refinement, a moderate degree of homogeneity is produced--the purpose being to insure the unidimensionality of the variable under consideration.

Although the Likert or summated ratings method outlines a relatively simple procedure for the collection and numerical representation of social data, it is subject to two important criticisms. Napior (1972), when referring to these criticisms, states:

> First, the item analysis procedure is arbitrarily unidimensional when a multidimensional approach to the data would often prove to be more fruitful. Secondly, the scoring system requires a number of unnecessary assumptions about the distributional and metric properties of the data (p. 160).

In fact, many researchers now consider Likert scales to yield ordinal data only, and as such are not in favor of averaging scores obtained from such scales.

Although the metric properties of the data obtained from the Likert scale are questionable, no such problems are encountered using a scale developed by Guttman (1944). By using a Likert-type of questionnaire but scaling the data much differently than the summated ratings technique, he offered still another basis for scaling qualitative data. Guttman summarized his scale when he declared:

> The multivariate frequency distribution of a universe of attributes for a population of objects is a scale if it is possible to derive from the distribution a quantitative variable with which to characterize the objects such that each attribute is a simple function of that quantitative variable (p. 149).

He further demonstrated that if the data are scalable, the order of objects (or attitudes) is in general unique (except for direction).

Another paper describing the Cornell technique, so named and developed by Guttman (1947), defined a ". . . procedure for testing the hypothesis that a universe of qualitative data is a scale for a given population, using the scalogram approach" (p. 248). This procedure consists of two initial steps. First, the universe of content to be studied is defined. In an attitude study, this means defining the general category of questions to be asked. Second, the population of people is defined. In an attitude survey, this would mean defining and delimiting the class of people to be interviewed.

Once these two steps have been taken, a sampling technique is employed to 1) randomly sample the people to be interviewed and 2) sample the universe of content. For these two sampling problems,

distinctions between the pre-test and final survey must be appreciated. "Many fewer people can be used in a pre-test than must be used in the final survey, but fewer items can be used in the final survey than must be used in the pre-test" (p. 248). Guttman recommends a minimum of 100 persons for an adequate sample of the population to test the hypothesis of scalability. When discussing this hypothesis, Guttman states:

> The universe is said to be scalable for the population if it is possible to rank the people from high to low in such a fashion that from a person's rank alone we can reproduce his response to each of the items in a simple fashion. It is understood that a perfect scale is not to be expected in practice. Data have been considered sufficiently scalable if they are about 90 per cent reproducible, and if certain other conditions are satisfied (p. 249).

Guttman presents several concrete examples of his Cornell technique in the paper and outlines, in considerable detail, its use.

The preceding scales for measurement of attitude--the Thurstone scale, Likert scale, and Guttman scale--constitute the classic direct approach to attitude assessment. And although these scales are still used, many researchers, such as Campbell (1950), believe there is a very ". . . real need for instruments which do not destroy the natural form of the attitude in the process of describing it" (p. 15). For instance, in assessing "prejudice," the researcher may not want the respondent to be self-conscious or aware of the purpose of the study. In attempting to classify attitude assessment techniques, Campbell

distinguished four types of tests:

> 1. Non-disguised-structured: the classic direct attitude tests of Thurstone, Likert, et al.
> 2. Non-disguised-non-structured: the free-response interview and questionnaire approaches, the biographical and essay studies.
> 3. Disguised-non-structured: the typical "projective" techniques.
> 4. Disguised-structured: tests which approximate the objective testing of attitudes (p. 15).

The remaining part of this section on literature related to attitude measurement will review alternatives to the classic direct method of attitude assessment.

Alternative Attitude Tests

In the "disguised-non-structured" category, there are several established attitude instruments. One such instrument is the Thematic Apperception Test (T. A. T.). This technique uses pictures or slides and has the respondent write a short story or essay about each picture. (Sometimes a verbal response is used.) Proshansky (1943) investigated attitudes toward labor in a classic study employing this methodology. Another successful study, using the T. A. T., was conducted by Johnson (1949). His study investigated the development of Anglo-Spanish attitudes in the Southwest through stories told by children to a specially designed series of pictures.

Another technique for the assessment of attitudes is the "doll-play" method where respondents are asked to manipulate dolls to

fashion a dramatic scene or scenes which illustrate the world as they see it or would like it to be. Among the earliest psychologists to use this technique was Dubin (1940) in his attitude study dealing with labor, the Negro, internationalism, among others. In another study, Hartley and Schwartz (1948) combined doll-play with pictures to investigate intergroup attitudes of children five to seven years of age.

Other techniques falling into the "disguised-non-structured" category include the "sentence completion tests." Although Rotter and Willerman (1947) developed this method for the purpose of studying personality, others have modified it for the purpose of investigating attitudes. For instance, a study of personality and prejudice among school children was conducted by Frenkel-Brunswik and Jones (1946) using this method.

In the "disguised-structured" category, there are also several methods for investigating attitudes. Information tests comprise a general class of such a method. The basic theory is that in a detailed test of information, the direction of people's guesses or misconceptions will frequently bear a relationship to their attitudes. A study that dramatically supports this theory was conducted by Newcomb (1946) when he demonstrated the non-random character of right and wrong answers on an information test.

A respondent's estimation of group opinion and social norms provides still another method of assessing attitudes in a disguised but

structured manner. As Travers (1941), Wallen (1943), and others have demonstrated, there is a persistent correlation between a person's own attitude and his perception of group opinion. Their findings showed that while there may be a few persons who consistently underestimate the popularity of their own opinions, the prevailing tendency is to overestimate the size of the population agreeing with one's self.

Modern technology has provided still another interesting method for assessing attitudes that does not require any "response" or estimate on the part of the subject. Cooper and Pollock (1959) have managed to identify prejudicial attitudes by measuring the galvanic skin response of the subjects being tested. (No attempt was made to classify this technique using Campbell's four types of tests.) Their procedure consisted of reading nine complimentary statements to the subjects. These statements referred to an ethnic or national group. As these statements were read, the galvanic skin response (GSR) was recorded for each statement. At a later time, each subject completed a paired-comparisons scale and ranked the groups according to preference. Their tests demonstrated:

> . . . that relatively great affectivity (as measured by relatively great GSR). . .[was] indicative of relatively great antipathetic prejudicial-attitude (as measured by a relatively low position on the paired-comparison scale) (p. 244).

Essentially, this study drew upon earlier works by Cooper and Siegel (1956), and Cooper and Singer (1956).

In 1962, a study by Fishbein and Raven (1962) attempted to provide an operational definition of belief and attitude. Drawing upon Osgood's semantic differential (Osgood, Suci, and Tannenbaum, 1957), they selected a set of scales which yielded five polar adjectives that measured belief, and five that measured attitudes. Their study demonstrated ". . . that a change in attitude toward a particular concept could result from a change in belief about that concept" (p. 42). In summarizing their study they suggested that belief and attitude be defined in the following manner:

> "Belief". . .[should be] defined as the probability dimension of a concept - "Is its existence probable or improbable?" "Attitude" . . .[should be] defined as the evaluative dimension of a concept - "Is it good or bad?" (p. 42).

Employing yet another technique for attitude assessment, Triandis and Triandis (1960, 1962) investigated a concept termed "social distance." In their studies, they measured social distance by determining what kinds of people are avoided, and how much they are avoided. Their procedure consisted of asking a person to indicate whether he would accept a particular kind of person (for example, a Negro) as an intimate friend, as a neighbor, as a fellow employee, and so on, or whether he would exclude him from such relationships. Their findings showed that social distance was greatly influenced by cultural norms concerning what was appropriate behavior towards persons who are "different." A much earlier study by Bogardus

(1928) pioneered the concept of social distance in an investigation of immigration and race attitudes.

The final attitude measurement technique discussed in this section was also offered by Triandis (1964). Basing his study on a suggestion by Katz and Stotland (1959), he investigated the behavioral component of social attitudes using a statistical technique known as factor analysis. And although the basic thrust of his paper was to advance a methodology for such an investigation, he did present several examples of the kind of data and results that are obtainable using factor analysis.

This concludes the section pertaining to attitude measurement. Although the literature dealing with this subject is voluminous, classic studies have been selected for inclusion that provide an accurate highlight of work done in this field.

Literature Related to Multidimensional Scaling Theory

This section on multidimensional scaling theory was included for two reasons. First, a general purpose or reason for using MDS over other available attitude scaling techniques was needed. Second, the background and history of MDS adds an important perspective to the resultant application of MDS to attitude scaling. A mathematical treatise of MDS will not be offered; although interesting, it would not

contribute substantially to the central purpose of this study. Instead, the two parts of this section consist of:

1. Literature related to the purpose of MDS
2. Studies portraying the historical development of MDS.

The Purpose of Multidimensional Scaling

In the preceding section, the assumption of the unidimensionality of the variable being measured was a requirement of the instrument. Many times, however, the data may not support such an assumption. Nevertheless, most of the scales discussed in the preceding section are still in use today. However, more sophisticated scaling techniques have recently emerged with the advent of the modern computer. Such a method is multidimensional scaling analysis.

There are currently several techniques which are classified under the term "multidimensional scaling." They all share a common purpose, however, as Shepard (1972) states:

> The unifying purpose that these techniques share, despite their diversity, is the double one (a) of somehow getting hold of whatever pattern or structure may otherwise lie hidden in a matrix of empirical data and (b) of representing that structure in a form that is much more accessible to the human eye - namely, as a geometrical model or picture (p. 1).

The objects being investigated, such as stimuli, persons, or nations, are usually represented as points in a spatial model in such a manner as to reveal and emphasize the geometrical relationships among the

points. Torgerson (1958) further states the assumption that ". . . the distance between any two points in the space is a function of the degree of similarity of the two stimuli" (p. 250). Normally, as the degree of similarity between two stimuli decreases, the distance between their corresponding points increases.

The resulting spatial structure represents more traditional scales in that the objects (and their representative coordinate points) are scaled according to fundamental properties or attributes they possess. What MDS further allows is the full complexity of these attributes--principally their interrelatedness--to emerge in the number of dimensions that are required to accurately represent the data. Normally, an attempt is made to minimize the number of dimensions consistent with the data. Of course, care must be exercised when minimizing the spatial dimensions or the data may be unduly distorted or "stressed." The term "stress" was coined by Kruskal (1964a, b) and refers to an index of fit between the final scaled distances of the stimuli points and numbers derived from the original similarities data.

Once the data have been multidimensionally scaled, the "dimensions" must still be interpreted and labeled; no MDS routine will provide this information. As Shepard (1972) asserts, what MDS does is ". . . enable the investigator to gain a better understanding of the total underlying pattern of interrelations in his data. . ." (p. 3).

Sometimes, in spite of an increased understanding of the data, the procedure of finding interpretable axes can still be very difficult and uncertain. However, if potential properties or attributes can be identified in advance, the problem of axis labeling can be minimized to some extent.

In summary, Torgerson (1958) states succinctly that MDS involves essentially two steps:

> 1. A theory concerning the characteristics of the multidimensional space. This theory relates the dimensionality of the space and the projections of points on axes of the space to the distances between the points.
> 2. A theory relating distances between the points to observable relations between the stimuli. . . .[In many cases], distances are related to observations on the relative similarity of stimuli (p. 250).

The first step relates to a spatial or geometric model and specifies the formal characteristics of the postulated psychological space. The second relates to a unidimensional scaling model for scaling distances on a psychological distance continuum (or scaling stimulus pairs on a similarity continuum).

The History of Multidimensional Scaling

Historically, much of the credit for laying the mathematical foundation for MDS goes to Young and Householder (1938). Because of three powerful theorems they proved, the problem of determining whether "psychological" distances have the same properties as "real"

distances (distances among points in Euclidian space) could be solved. To have the same properties, the psychological distance between the stimulus and itself had to be zero, the distances had to be nonnegative, and the triangle inequality had to be satisfied ($d_{ij} + d_{jk} \geq d_{ik}$, where i, j, and k are stimuli and the d's represent the distances between the pairs of stimuli).

These three theorems were:

1. If the psychological distances are to be represented as distances between points in Euclidian space, the matrix of scalar products determined from the distance estimates must be positive semidefinite (all characteristic roots of the matrix be nonnegative and at least one root be equal to zero).
2. The dimensionality of the space needed to represent the stimulus points is equal to the number of positive roots of the scalar-products matrix.
3. The projection of points upon the reference axes of the space can be determined by factoring the scalar-products matrix in a particular manner.

The next important milestone in the development of MDS occurred in 1952. At that time, a MDS technique was perfected which has become known as the "classical" or "metric" approach to multidimensional scaling. (This approach has also been called the "Princeton"

or, more specifically, the "Torgerson" approach.) Building upon the mathematical groundwork of Young and Householder, classical MDS was developed largely due to the efforts of people associated with Guliksen's psychometric group at Princeton University. Included in this group were Messick and Abelson (1956) and, notably, Torgerson (1952)--who achieved the first generally workable MDS method. In fact, Torgerson's (1958) textbook has since become a classic on the treatment of theory and methods of scaling in general. This textbook includes a comprehensive presentation of his efforts at developing multidimensional scaling.

Still another important phase in the evolution of MDS was recorded 10 years later at the Bell Telephone Laboratories. This phase consisted of the development of the "nonmetric" approach to multidimensional scaling. (In honor of the two men who pioneered this effort, it is sometimes called the "Shepard-Kruskal" approach.) The initial work was done by Shepard (1962a, b), under the name "analysis of proximities," and was later improved by his mathematical colleague Kruskal (1964a, b) in the conceptual and computational parts of the methodology.

Since then, and in order to deal with increasingly diverse types of data, many methods deriving in one way or another from the "nonmetric" approach have been devised not only by Shepard and Kruskal but also by many others. Shepard (1972), when referring to these

individuals, included:

> . . . J. J. Chang, S. C. Johnson, E. T. Klemmer, L. Nakatani, M. Wish and, particularly, J. D. Carroll (all of the Bell Telephone Laboratories), as well as J. DeLeeuw, T. Gleason, L. Guttman, J. C. Lingoes, V. McGee, E. I. Roskam, W. S. Torgerson, F. Young, and others (elsewhere) (p. 5).

All of these researchers cited by Shepard have contributed many refinements to multidimensional scaling--especially in the field of MDS theory.

Besides the work done on MDS at Princeton and the Bell Labs, contributions to the "nonmetric" approach to MDS have come from C. H. Coombs and his students at the University of Michigan. Their main thrust has been to offer a variety of models for the multidimensional representation of ordinal data (Coombs, 1964). And although specific methods devised by Coombs and his students have not been widely used for multidimensional analyses, they have had an appreciable influence on the work done at Bell Labs.

One reason for the lack of use of Coombs' methods is that they have not been converted to computer programs due to insufficient formalization of the methods. Another reason, as stated by Shepard (1972), is:

> . . . these methods fail to extract the very substantial metric information that is implicitly contained in the given "nonmetric" data and, so, do not provide the kind of highly constrained, uniquely picturable, and rigidly rotatable sorts of spatial representations now obtainable by the newer methods (p. 5).

However, although a number of his methods have been superseded, a number of his models--most notably his "ideal points" or "unfolding" models--have served as a basis for the newer methods of Carroll, Kruskal, Guttman and Lingoes, among others.

This concludes the section of literature review related to multidimensional scaling proper. Throughout the section, an effort was made to minimize the mathematical and technical aspects of MDS; although the nature of the subject necessitated the use of much of the terminology related to MDS. Furthermore, the terminology introduced in this section was needed for the following section (pertaining to the application of multidimensional scaling theory).

Literature Related to the Application of Multidimensional Scaling Theory to Attitude Measurement

Technically, although most of the applications in this section involve "attitudes," some of them could have been classified as "beliefs" (Fishbein and Raven, 1962)--and both have been included. As in previous sections in this chapter, this section on applications of MDS to attitude measurement and scaling was divided into two parts:

1. Literature related to the application of MDS to "noneducational" attitude items

2. Literature related to the application of MDS to "educational" attitude items.

Noneducational Applications

In 1938, about the time Young and Householder (1938) were laying the mathematical groundwork for multidimensional scaling, Richardson (1938) was conducting an experiment using MDS to analyze standardized Munsell color chips varying in brightness and saturation. Even though efficient computational procedures had not been developed, in this earliest MDS experiment, Richardson obtained results reported to be in close agreement with the corresponding Munsell dimensions of value and chroma. Much the same experiment was repeated by Torgerson (1951) using more efficient procedures. He applied the method to a set of nine gray stimuli which differed only in brightness. The stimuli were scaled by the multidimensional methods of triads (Torgerson, 1951, 1952; Messick, 1954). It was found that the multidimensional method yielded a unidimensional scale.

Until 1954, multidimensional scaling analysis was still based on the concept of psychological distance in the psychophysical domain--such as perception of color. Abelson (1954), however, could see nothing to prevent the transference of the multidimensional method from psychophysical scaling to attitude scaling. Social distance was already a well-known social-psychological phrase developed

by Bogardus (1925). Using the method of successive intervals, Abelson presented 12 statements relating to war, armaments, and communism to 42 subjects. The subjects were requested to judge the similarity of pairs of attitude statements as well as their own agreement or disagreement with each of the 12 statements. Abelson's hypothesis was:

> [that] The attitude space. . .[could] be thought of as a frame of reference in which various attitudes are embedded because of their meaningful connections with the values which anchor the frame of reference (p. 418).

Abelson found consistent differences between the "attitude maps" of Socialist subjects and the maps of two groups of politically conservative subjects. His study effectively demonstrated the multidimensional nature of perceived attitudes regarding statements that were pro- and anti- war, armaments, and communism. Abelson's use of MDS as an attitude scaling technique provided a classic break with unidimensional techniques of attitude scaling and provided a model for future studies of this nature.

Two years later, Messick (1956) replicated (in effect) Abelson's study. Again using the method of successive intervals, Messick investigated the perception of attitudes of 40 third-year male students at the Princeton Theological Seminary and contrasted them with 82 Air Force officer candidates. Unlike Abelson, however, he used statements that were pro- and anti- war, capital punishment, and criminal correction. Messick found:

> The dimensional configurations obtained from both the seminary and Air Force groups certainly demonstrate that perceived relationships among attitudes toward war, capital punishment and the treatment of criminals can be adequately represented in dimensional terms. Apparently, then, individuals do think of these attitudes as having a definite structure, and when asked to make judgements concerning attitude statements, they respond in terms of such dimensional frames of reference (p. 65).

Surprisingly enough, only a slight difference was detected between the attitude space of the seminary students, when contrasted with the attitude space of the Air Force officer candidates regarding the 21 statements in the three "attitudinal" areas.

Regarding these areas, Messick selected all 21 statements from three Thurstone scales on attitude toward war (Peterson, 1931a), capital punishment (Peterson, 1931b), and the treatment of criminals (Wang and Thurstone, 1931). His selection of previously used items for his investigation was for the purpose of testing the claimed unidimensionality of the Thurstone scales. And while one attitude dimension was at an oblique angle with the other two parallel dimensions, the statement "points" within that dimension (as well as within the other two dimensions) were indeed unidimensional.

Some of the more recent applications of MDS have been in the field of marketing analysis. Using nonmetric MDS techniques almost exclusively, Neidell has delivered many papers in the United States and Europe on marketing problems and the role MDS can play in solving them. As an illustration, Neidell (1969) developed both an

attribute space and a perceptual space by collecting a sample of data from general medical practitioners regarding their perceptions of, and preferences for, brands of ethical pharmaceuticals. Using both the method of triadic combinations and rating scales for collecting data, he found essentially two dimensions: 1) high/low potency and 2) many/few side effects.

Once the perceptual space of various brands of ethical pharmaceuticals was established using the above two dimensions, the five separate brands were plotted and the "ideal brand" point was plotted. As Neidell (1969) explains, "The concept of the 'Ideal brand' is a simple one; it merely states that the closer a real brand is to the 'Ideal brand,' the more preferred is the real brand" (p. 41). The usefulness of this concept to marketing analysis cannot be understated.

As another illustrative example of nonmetric multidimensional scaling, Neidell (1969) drew upon the now-classic "roadmap problem." Using only the rank-order of 105 inter-city distances between 15 major cities in the United States, he applied TORSCA (a computer program written by Young and Torgerson) and plotted the resultant city coordinates against an actual map of the United States. While the largest error was 200 miles between a "plotted" city and its actual location, most of the error was due to using road distances which are often not the shortest straight line distances between any pair of cities. Thus the metric information contained implicitly in the ordinal

(rank-order) data was effectively revealed, using multidimensional scaling.

Multidimensional scaling has also been used in the political arena. Although Bechtel, Tucker, and Chang (1971) were primarily interested in developing a multidimensional technique for scaling choice, the example they included in their study is worthy of note. They selected three groups of subjects, namely, American school teachers, Canadian school teachers, and skilled laborers; they then asked them to state their preference between 21 pairwise choices of political candidates. Employing only two dimensions, labeled audacity and liberalism, they were able to plot not only the candidates but the individual responses of the subjects using their MDS model.

At the present time, there have been many new approaches and algorithms (as well as their corresponding computer programs) advanced upon the MDS scene. An excellent textbook that analyzes the various methodologies has been written by Green and Rao (1972). Specifically, the objectives of their book are:

> 1. To contrast various conceptual approaches to the multidimensional scaling of similarities and preference data;
> 2. To contrast a variety of algorithms designed for more or less similar purposes;
> 3. To provide brief descriptions of various computer run preparations (including specification of key control parameters), capsule descriptions of programs, and sufficient output so that our miniature data bank may be used as a sample problem, if desired;
> 4. To discuss a number of substantive problems arising in the analysis of the data bank used in the study;

> 5. To suggest a variety of content areas in which multidimensional scaling could be applied in future research (p. 3).

The data bank they established for their purposes consists of the responses of 21 college students and their wives (42 respondents in all) regarding their dissimilarities judgements, stimulus construct ratings, and preferences for 15 foot items used at breakfast and snack time. Using these data, the authors have fairly exhausted the various MDS techniques currently available.

Recently, two more books on multidimensional scaling have been edited by Shepard, Romney, and Nerlove (1972). One of these books (Volume II) contains many papers on the application of MDS to a multitude of problems. The remaining noneducational applications of MDS have been selected from this book.

Of the many studies contained in Volume II, one of interest was conducted by Burton (1972). His paper describes the results of a multidimensional scaling analysis of a set of 60 names of occupations in the English language. He collected his data from 54 people who responded to an advertisement in the Harvard student newspaper. "They had two tasks, to partition the set of occupational terms and to perform two paired-comparison tests" (p. 59).

By investigating the semantic structure of occupation names, Burton discovered three dimensions, namely, independence, prestige, and skill. Of these dimensions (or job attributes), prestige was

". . . the longest axis of the representation, indicating that prestige is the single most important criterion of the sorting task" (p. 70). He further employed an independently obtained scale of prestige and found a strong rank-order correlation with the multidimensionally scaled axis or dimension of prestige.

Still another study investigating semantic structures was conducted by Rapoport and Fillenbaum (1972). Their primary purpose was determining the structural properties of two different semantic domains: 1) color names and 2) the HAVE family of verbs. Their data were derived from perceived similarities (and dissimilarities) in meaning among the terms constituting each domain. From these data they were able to establish a meaningful dimensional structure for the color names, although they decided ". . . that a dimensional representation [was] not really appropriate. . . " (p. 127) for the verb family. They found that the axis of the solution could not be interpreted and that the terms were ". . . not distributed in an appropriately graded and intuitively sensible way in the space" (p. 127). Indeed, the two-dimensional Euclidian representations that they offered in their paper did not appear to yield dimensions that could be labeled.

The next paper (included in Volume II) was concerned with the structural representations of perceived personality trait relationships (Rosenberg and Sedlak, 1972). Using a semantic differential format for data collection, the researchers attempted to multidimensionally

scale 80 trait categories (i. e., cautious/bold, thrifty/generous, etc.). Possibly because of the high number of categories, they had a high stress (approximately 15 percent), even with five dimensions. They did, however, attempt to interpret these five dimensions; their findings were generally unclear.

One instructive paper, submitted by Stefflre (1972), dealt entirely with various applications of MDS to social science problems. Items that were scaled included similarity judgments of sandwiches, patent medicines and their use, food snacks and when to consume them, cigarettes, toilet soap, Peace Corps volunteers versus other types of people, and brands of coffee. Little attempt was made to analyze the results; rather, the findings were presented as an illustration of the type of data that is obtained when various kinds of items are multi-dimensionally scaled on the basis of perceived similarities.

The final study selected from Volume II (Shepard, Romney, and Nerlove, 1972) was authored by Wish, Deutsch, and Biener (1972). Their paper reported their study of the differences in perceived similarity of nations on the part of 90 volunteer subjects from 15 different countries. (They recruited their subjects by placing posters in the International House and Foreign Student Center at Columbia University.) Using the method of successive intervals, the subjects were asked to judge the similarity of 21 different nations. After this task, the subjects were asked to rate each nation on a semantic

differential scale with respect to 16 bipolar scales (i. e., dislike/like, weak/powerful, etc.).

Substantively, the results obtained from the similarity judgments yielded four dimensions which the authors ". . . interpreted as 'political alignment' (or ideology), 'economic development,' 'geography and population,' and 'culture and race' " (p. 311). Their labeling of the dimensions was facilitated and supported by the correlations with the data obtained from the rating scales. They also found:

> The importance, or weight, of "political alignment" relative to "economic development" was consistently greater for "hawks," females, and students from "underdeveloped" countries than for "doves," males, and students from "developed" countries (p. 311).

As they closed their article, they suggested that future studies might try to identify major types of perspectives on nations, variation as a function of perspective, and factors which cause one or another type of perspective to be dominant.

The preceding part of this section on applications of MDS has included studies that were considered to be noneducational applications of MDS. The remaining part of this section will contain studies that have emphasized a particular educational application of multidimensional scaling.

Educational Applications

Although multidimensional scaling has been applied to social

science problems for many years, little work has been done in applying MDS to educational problems. (One reason for this might be the inherent complexity of MDS--especially on the theoretical level.) The following studies are among the few that have emphasized a particular educational application of multidimensional scaling.

Recently, Seitz (1971) has conducted a methodological study of the multidimensional scaling of dimensional preferences of 144 kindergarten children. The children were enrolled in a Head Start summer program in three rural schools in southewestern Missouri. Seitz employed three stimulus sets, representing two values of two dimensions--color and form. Set 1 consisted of a red and blue circle and triangle (four stimuli), set 2 a yellow and green T-shape and square, and set 3 an orange and violet "plus"-shape and parallelogram. The subjects were asked to state their preference using Torgerson's method of triads (1951, 1952). (This method of data collection is especially good with young children because of the limited number of judgments that have to be made.)

By using the "cluster analysis" method of Tucker and Messick (1963) to scale the dimensional preferences of the children, Seitz concluded that:

> . . . the scaled preference values have high face validity, that they suggest the need for reexamination of some previous experimental results, and that the predictive validity of the scaled preference values should be investigated next (p. 1701).

Another important result of this study was the demonstrated usefulness of MDS at the lower age groups. Thus, MDS may be an effective technique to employ in the elementary schools to better understand the dimensional preferences and attitudes of children.

Recently, MDS was used to investigate children's vocabulary or "meaning space." As Evanechko and Maguire (1972) noted, ". . . little attention has been directed to the identification of the characteristics of their semantic competence" (p. 507). The purpose of their study was to develop an instrument that would measure any change that occurred, with age, for semantic preference. By using MDS, they defined a semantic space of the children and investigated how this space changed over time.

The test, administered to 266 students in the fifth and eighth grade of two centralized school districts in western Canada, consisted of 276 paired-comparison items. Each element of the pair was a definition that illustrated a certain semantic relationship. The child was required to choose the "better" definition. An advantage of using the paired-comparison method of data collection and requiring a this-or-that judgment is the resultant simplicity; a disadvantage is the large number of pairings (276) resulting from only 24 items or categories.

The results of their study are quite interesting. Their findings showed there was a substantial change in the organization of meaning

categories into dimensions with change in age, although preferences for categories did not vary markedly.

> Younger Ss revealed a generally less powerful organization of definitions in their dimensions which emphasized a dependence upon concrete meaning relationships. Dimensions identified for the older Ss included more of the superior class-type strategies of signification indicating their ability to go beyond sensory and experiential data to generate meaning (p. 521).

Specifically, the fifth graders appeared to require previous experience or examples of referents to give meaning to the categories. The eighth graders, on the other hand, appeared to look for relationships among the stimuli rather than merely depending upon experience with them to give them meaning.

As a further interpretation of their results, Evanechko and Maguire suggested that:

> . . . teachers might be advised to concentrate their attention on developing strategies and cognitive organizations which allow children to attend to different kinds of meanings under different circumstances (p. 522).

However, evaluation of the development of the child's semantic competence requires an appropriate instrument, such as multidimensional scaling analysis.

In the previous study, MDS was used to structure a semantic space. In another study, Wainer and Berg (1972) used MDS to determine the perceptual space employed by a group of students in judging a set of literary works. Their subjects were 35 advanced French

majors who had been assigned nine short stories by Guy De Maupassant. A week after the assignment was made, the students were asked to rate the similarity of all possible pairings of stories (36 in all) on a scale of 1 to 10. A response of one was to mean that the two stories in a given pairing were virtually identical. The information received was processed and yielded an "inter-story" distance matrix.

Once the distance matrix had been determined, they applied the Shepard-Kruskal procedure of nonmetric multidimensional scaling and obtained two dimensions. The first dimension, the easiest to identify, had rather violent stories on one end and gentle, sometimes whimsical stories on the other end. Hence they interpreted this as a violence dimension, based on the content of the stories. They further confirmed this dimension by asking 20 of the students to rate the nine stories with respect to a "violence" scale. A rank-order correlation of 0.89 was obtained between the scale values and the projections of Dimension I.

Dimension II was more difficult to interpret. The two attributes of the stories (related to Dimension II) that seemed plausible were: 1) the trick or surprise ending at the end of the story, and 2) a character in the story that was deceived or tricked (as in contrast to the surprise ending where the reader was deceived or tricked). To solve the dilemma, 20 students were asked to rate the nine stories

with respect to two scales that were labeled to correspond to the two possibilities. From these judgments, they obtained scale values for the abruptness of the ending and scale values for the fulfillment of the principal character. The rank-order correlations of these sets of scales were 0.53 and 0.84 respectively. Accordingly, they interpreted this axis as a fulfillment dimension. Thus Dimension II, like Dimension I, appeared to be based on story content.

In a discussion of the MDS procedure, Wainer and Berg drew the following conclusions:

> We therefore conclude that the procedure we used is an objective, accurate and reliable way of determining the structure of a multidimensional set of items. It can then be easily used prior to any instruction and/or discussion of a set of literary works to determine the student's perceptions of the works, and then a follow-up could be done after instruction to examine how much the classroom experience has changed their views (p. 490).

In fact, one might anticipate an increased dimensionality of the perception space after classroom discussion, since the instructor could point out facets of the story which were not clear initially. Furthermore, if the perceptions of literary works can be measured in such a manner using MDS, the application of MDS to other "nonquantitative" fields such as art and music appears to be a distinct possibility.

The final study included in this section on the application of MDS was done by Napior (1972). Using nonmetric multidimensional scaling, he suggested a different technique for processing data

obtained using the method of summated ratings. His improved methodology is based on the fact that there are several assumptions that may not be justified when using the scoring procedure offered by Likert (see p. 12). Napior states:

> Unfortunately, the computational algorithm recommended by Likert for item selection and derivation of scores for respondents requires investigators to make assumptions about the dimensional, distributional, and metric properties of their data that frequently cannot be supported; however, computational and computer hardware advances have made it possible to avoid the burden of these assumptions (p. 176).

In place of Likert's recommended procedure for processing the data, he suggests a two-stage analysis of the data.

In the first stage, Napior recommends using the Goodman-Kruskal gamma (Goodman and Kruskal, 1954) to obtain inter-item correlations of the initial summated ratings scores. After the correlation matrix has been constructed, he further recommends using the Shepard-Kruskal procedure of nonmetric multidimensional scaling to isolate unidimensional subsets of items. These subsets are used in stage two.

In the second stage, Napior suggests applying Guttman's least-squares scaling procedure (Guttman, 1950) to each of the unidimensional subsets. Napior believes:

> In many situations Guttman's least-squares scaling model should prove to be a significant improvement upon Likert's integer and sigma scoring procedures. Guttman's system makes far fewer assumptions than does Likert's about metric and distributional properties underlying responses

> to items and yields scale weights and scores equal in utility to those rendered by either of Likert's systems (p. 176).

As an illustration of the above two stages of analysis, Napior included an interesting application of his methodology to an educational problem related to teachers' attitudes.

Napior employed a Likert-type questionnaire that requested a group of teachers to rate the need for change in the behavior and attitude of their principal, other teachers, parents, and students with respect to various common roles. He then processed these data using his two-stage analysis and plotted the results in two and three dimensions. A nonmetric factor analysis of the data was also included for purposes of comparison to multidimensional scaling analysis.

With the conclusion of this section (and the preceding one), the review of literature related to multidimensional scaling is completed. The next and final section includes literature related to the attitudes of community college personnel with respect to academic freedom, academic rank, collective bargaining, merit pay, teacher evaluation, and tenure.

Literature Related to Attitudes of Community College Personnel

Because of the interrelatedness of the six concepts and the attitudes of community college personnel regarding them, this section

was not subdivided. However, the related literature (by concept) was presented in the following approximate order: 1) academic freedom, 2) academic rank, 3) collective bargaining, 4) merit pay, 5) teacher evaluation, and 6) tenure.

Over the years, academic freedom has been misunderstood by both laymen and educators. Much of the confusion and controversy surrounding it is probably due to a misinterpretation of the amount of "freedom" involved. Academic freedom does not imply total freedom to profess any opinion on any subject without discretion. To the contrary, in an article entitled "Academic Freedom and Tenure, 1940 Statement of Principles" (1963), the American Association of University Professors adopted the following position:

> The teacher is entitled to freedom in the classroom in discussing his subject, but he should be careful not to introduce into his teaching controversial matter which has no relation to his subject. Limitations of academic freedom because of religious or other aims of the institution should be clearly stated in writing at the time of the appointment.
>
> The college or university teacher is a citizen, a member of a learned profession, and an officer of an educational institution. When he speaks or writes as a citizen, he should be free from institutional censorship or discipline, but his special position in the community imposes special obligations. As a man of learning and an educational officer, he should remember that the public may judge his profession and his institution by his utterances. Hence he should at all times be accurate, should exercise appropriate restraint, should show respect for the opinions of others, and should make every effort to indicate that he is not an institutional spokesman (p. 192).

It is this AAUP position on academic freedom that is employed at

Portland Community College (Policy Manual, May 1, 1972, II - 23, p. 9)--the institution where this study took place.

Portland Community College is not atypical in adopting the AAUP position on academic freedom. Blocker et al. (1965) state that:

> Consistent with the growing maturity of the two-year college is the shift from provincial to cosmopolitan attitudes toward academic freedom. . . . most colleges are adopting the position of the American Association of University Professors on academic freedom (p. 161).

In fact, in a survey conducted by Kelley and Wilbur (1970), 62 out of 118 respondents said they "liked the 'academic and personal freedom' at the community-junior college" (p. 191) and listed this freedom as a major reason for teaching there.

The fact that college faculties may enjoy academic freedom does not, however, preclude their being evaluated as teachers. Mayhew (1970), when writing about possible Arrogance on Campus, warns that:

> . . . academic freedom cannot be considered as protection against evaluation and judgement of performance, including administrative assessment. Regardless of how casually or systematically it is done, evaluation and judgement of professional worth are constantly being made (p. 106).

Thus the relationship between the concepts of academic freedom and teacher evaluation is not mutually exclusive.

Another controversial issue among community college personnel is the concept of academic (or faculty) rank. A survey by Garrison (1967) indicated:

> If feeling about the matter can be loosely divided into two camps, it was perhaps the liberal arts instructors who expressed more concern about establishing a system of rank than did their colleagues in the vocational and technical fields (p. 68).

Thornton (1972) also found considerable evidence indicating a ". . . lack of agreement among junior college administrators and faculty members on the wisdom of imitating the ranking policies of the colleges and universities" (p. 141). Hendrix (1963) also questioned the wisdom of establishing such policies.

> Academic rank policies and procedures are associated with some desirable characteristics, but are also uniquely related to sufficient undesirable characteristics to cast suspicion on the advisability of such policies for the public junior college (p. 30).

Such are a few of the arguments against establishing academic rank at the two-year college; the following opinions were cast in favor of it.

Responses to a questionnaire submitted by Kelley and Wilbur (1970) revealed that 29 out of 118 faculty members complained about ". . . no rank among our faculty, while university people enjoy this extra status symbol" (p. 194). So while some junior college personnel question the wisdom of imitating the university regarding academic rank, others believe this "imitation" to be desirable. Freiberger and Crawford (1962) further argue:

> For or against is no longer the consideration regarding the established standard of academic rank and title. The big question lies in how to arrange, organize, and balance this distinction in the hundreds of junior colleges all over the country (p. 89).

Ironically enough, a survey of 17 public junior colleges by Blocker et al. (1965) revealed that the primary responsibility for introducing academic rank seemed " to lie with the college administrators" (p. 153). They further found that in a majority of 20 private colleges, "the administration initiated the academic rank system" (p. 153). This same study by Blocker et al. (1965) states:

> The reason most often given was the desire to conform to the university system; the second, to link salary and teaching proficiency [merit pay]; the third to increase the status and morale of the faculty (p. 154).

At this time, Portland Community College does not employ a system of academic rank; contracts issued to faculty members refer to them as "instructor."

Contracts at Portland Community College are negotiated by a faculty committee working in conjunction with the college administration. Collective bargaining has never been employed; however, a chapter of the American Federation of Teachers has recently been formed at PCC. Furthermore, recent legislation in Oregon has granted collective bargaining rights to community college faculties in the state. It may be just a matter of time before community colleges in Oregon join the national trend and employ collective bargaining.

Mayhew (1970) states one possible reason for a national movement to collective bargaining at junior colleges.

> The most fertile grounds for unionization are junior colleges and state colleges in transition, which have a high

> proportion of faculty who are desperately trying to leave the high school or teachers college category but without success (p. 69).

Still another reason offered by Ikenberry (1971) for the rapid adoption of collective bargaining at the two-year college is that it affords the faculty a "principle mode of participation in governance" (p. 14) of the college. On a positive note, Nelson (1972) believes collective bargaining could be used as an instrument for staff development.

> Collective bargaining could provide a context within which to forge mutually acceptable professional development opportunities and responsibilities and the master agreement could exert the force necessary to fulfill such potential (p. 27).

On a more negative note, Mayhew (1970) contrasts collective bargaining with academic freedom.

> Unionization, collective bargaining, and the strike imply that services a professor provides can be specified in some detail and listed and can have a definite price placed upon them. Academic freedom on the other hand is an open-ended privilege based on the mystique that out of freedom something good will come (p. 102).

Currently, the national trend appears to be in favor of employing collective bargaining; however, it will probably continue to be a controversial issue.

Still another controversial issue is the concept of merit pay--the antithesis of collective bargaining, to some extent. Furthermore, if the national trend is to employ collective bargaining at two-year colleges, one would not expect to find any great support for merit pay on the part of two-year college faculties. Indeed, there does not

appear to be much. In a study of the issues and problems of junior college faculty, Garrison (1967) noted that:

> . . . when the question of merit pay was raised, the familiar arguments of resistance were offered: "Who will do the evaluating?" "It will just rouse hard feelings." And more often, "We may not like the system; but we'd certainly like to hear of places that have figured out something new and better" (p. 23).

These same questions have also been asked at PCC by many faculty members.

At Portland Community College, the administration has appeared to favor the concept of merit pay while the faculty has been reluctant to proceed with a merit pay system. However, evaluation committees do affect teachers' salaries by making positive or negative recommendations for movement on the steps and levels of the salary schedule. The PCC Policy Manual (November 20, 1972, II - 41) states:

> The evaluation committee will discuss with the instructor the results of the evaluation procedures as previously agreed upon and shall prepare a written recommendation. The recommendation shall include movement from step to step, level to level, retention, nonretention, and continuous appointment. In the case of movement from level to level and continuous appointment, the instructor will be expected to have fulfilled successfully the criteria in number 2b (p. 2).

Because the criteria in number 2b involves 1) general effectiveness of instruction and 2) general effectiveness in student advising, among other things, merit pay does exist at PCC, to some extent.

Intimately related to merit pay is the concept of teacher evaluation--another controversial issue among teachers. Recent guidelines for teacher evaluation in California have caused some consternation among community college teachers. A study by Schulman and Trudell (1972) showed that:

> . . . 164 out of a possible 256 respondents within the Los Angeles Community College District. . . showed mistrust of the purposes of evaluation for tenured instructors, fearing that it might interfere with academic freedom and could stifle creativity and innovation (p. 33).

When these same respondents were asked what the main purpose of teacher evaluation should be,

> Data revealed opinions that "improvement of instruction" was the most valid purpose for evaluation and that the process should be conducted mainly by peers with participation by administration, department chairmen and students (p. 33).

Likewise at Portland Community College, the Policy Manual (November 20, 1972, II - 41) states:

> The purpose of evaluation of instruction should be to increase the instructor's awareness of education methods, problems and goals, and to further his ability to improve himself and his classes (p. 1).

However, teacher evaluation also plays a primary role in "the recommendation for selection, advancement, renewal, non-renewal, and continuous appointment of faculty" (p. 1) at PCC. Thus the interrelatedness of the concepts of merit pay, teacher evaluation, and continuous appointment (tenure) emerges in PCC policy.

The final concept to be discussed in this section is tenure. And although many junior colleges have tenure policies, Kelley and Wilbur (1970) found that "Only a few states have statutory tenure laws protecting junior college teachers" (p. 39).

Most institutions appear to have adopted some modified form of tenure as recommended by the AAUP--including Portland Community College. However, as a matter of discretion, PCC has preferred to call it "continuous appointment." As stated in their Policy Manual (May 1, 1972, II - 23),

> Continuous appointments for instructors may be terminated only for (1) adequate cause, (2) retirement for age, or (3) under the extraordinary circumstances of a bona fide financial exigency, involving retrenchment or discontinuance of an instructional program or a department of instruction (p. 2).

Furthermore, the total period of full-time service prior to the acquisition of continuous appointment may not exceed five years, including all previous full-time service with the rank of instructor or higher in other secondary schools or institutions of higher learning.

The preceding section has provided the closing material in the review of literature. The following final section presents a brief summary of this review in order to enhance the continuity and perspective of the literature discussed in this chapter.

Summary

The reviewed literature has provided the foundation for the

present study. The first section on attitude measurement discussed the classical methods of Thurstone-Chave (1929), Likert (1932), and Guttman (1944). Alternative attitude tests were discussed next and an operational definition of belief and attitude was presented (Fishbein and Raven, 1962).

The section related to MDS theory explored the purpose and history of multidimensional scaling. The fact that classical attitude instruments were necessarily unidimensional even though attitudes themselves were not, documented a need for a multidimensional instrument--such as MDS--to measure attitudes.

The review included a brief discussion of the history of MDS--especially the mathematical foundation provided by Young and Householder (1938). As a result of their work, the separate approaches to MDS by Torgerson (metric) and Shepard and Kruskal (nonmetric) were conceived. Contributions of Coombs (1964) were also cited.

Further, the literature described various applications of MDS to attitude measurement--both educational and noneducational. In the noneducational category, historical works of Richardson (1938) and Torgerson (1951) on Munsell color chips were described. Also, the breakthrough of Abelson's (1954), as he employed MDS as an attitude measurement instrument for the first time, was of primary significance. A later replication (in effect) by Messick (1956) strengthened

Abelson's findings. Other recent studies have also secured the use of MDS as a useful instrument for measuring attitudes.

Despite the merits of MDS, little work has been done in applying it to educational problems. The few studies done have investigated classroom learning, although Napior (1972) demonstrated the use of MDS as an improved method of scaling summated ratings on an educational attitude questionnaire. Lack of research in educational attitudes using MDS indicates a need for establishing and substantiating this methodology.

Finally, the literature discussed some of the prevailing attitudes and beliefs of junior-community college personnel regarding the six concepts germane to the present study. In addition, special attention was given to the climate at Portland Community College regarding these concepts. This climate provided the necessary background with which to frame the present study--the perception of attitude structures regarding academic freedom, academic rank, collective bargaining, merit pay, teacher evaluation, and tenure.

III. DESIGN OF THE STUDY

The present study was an investigation of the applicability of multidimensional scaling for structuring perceived attitude relationships of selected community college personnel regarding six educational concepts. This chapter explains the procedures used in achieving five objectives of the study (see p. 3) and was divided into five main sections: Preparation of the Questionnaire, The Dependent Variables, The Sample, The Collection of Data, and The Statistical Design.

Preparation of the Questionnaire

The questionnaire employed in the study was based on the method of successive intervals used by Abelson (1954) and Messick (1956), among others (see Appendix A for a copy of the questionnaire). The concepts to be multidimensionally scaled were numbered and randomly selected such that one concept was printed on the top of each page, followed by a list of the remaining concepts (paired with the top concept) at the left. To the right of each pairing appeared a series of seven boxes; the first box was labeled "Strongly disagree," the fourth "Neutral," and the seventh "Strongly agree." The subject was asked to imagine the type of community college teacher who would strongly agree with the concept at the top of the page and then

decide how this same teacher would also feel about the bottom concept in each pairing. The subject was then asked to indicate the extent of this imagined teacher's agreement or disagreement by placing a cross in one of the boxes to the right.

On the last page of the questionnaire, the subject was asked to indicate the extent of his agreement or disagreement with each of the six concepts listed on the page. The same successive intervals scale of seven boxes was used for this page as was used in the preceding six pages.

The Dependent Variables

The multidimensional method of successive intervals requires that the subject judge all possible pairs [$n(n - 1)/2 = 15$] of the six concepts on a distance continuum according to the degree of relatedness or agreement shown between the members of each pair. In order to obtain judgments about perceived attitudes, the question of relatedness was set up in terms of the attitudes of some other community college teacher as described above. This judgment is equivalent to estimating the "distance" between concepts A and B, while located at A. In each pairing of concepts, the reverse was also asked--judge the "distance" between concepts B and A, while located at B. As a result, two judgments of the same distance (taken from opposite directions) were obtained from the subjects providing 30 interpoint distance estimates instead of 15.

In the present study, a determination was made whether judgments of the same distance taken from opposite directions would be similar. The two judgments obtained from each pair of concepts were considered as independent estimates; scale values were determined for both distances AB and BA. Because of the requirement that multidimensionally scaled distances between two points be the same in both directions, the differences between the AB and BA distances should be small. With this criteria in mind, all AB and BA distances that were more than two intervals apart were discarded. Those distances that were two intervals (or closer) apart were averaged, resulting in a maximum of 15 interpoint distance estimates from each subject. These distance estimates ranged from a low of zero (maximum amount of similarity) to a high of six (minimum amount of similarity).

Besides the interpoint distance estimates, preference judgments were also obtained from each of the subjects regarding the six concepts. These scores ranged from a low of zero (minimum amount of preference) to a high of six (maximum amount of preference). Consequently, the two dependent variables in this study were:

1. The 15 averaged interpoint distance estimates of the subjects regarding the six educational concepts
2. The six preference scores of the subjects regarding the six educational concepts.

While the dependent variables were analyzed using different statistical methodologies, they were obtained from the same sample.

The Sample

The sample for the study consisted of three diverse groups of community college personnel: administrators, academic teachers, and vocational/technical teachers. In addition, all personnel had been employed by Portland Community College for at least one year at the time they participated in the study.

The composition of the sample is shown in Table 1.

Table 1. Composition of the sample.

Administrators (N = 27)		Academic (N = 27)		Vocational/Technical (N = 27)	
President	1	Sociology	2	Drafting	5
Dean	5	Economics	2	Machine	3
Department Chairmen	15	History	5	Welding	3
Staff	6	Psychology	5	Automotive	5
		Geography	2	Electronic Engineering Technology	6
		Political Science	1	Mechanical Engineering Technology	3
		English	10	Civil Engineering Technology	2

The Collection of Data

Data for the study were collected during the 1973 fall quarter at Portland Community College. Data from administrators were obtained by distributing questionnaires at a seminar conducted by PCC staff; data from teachers were obtained by distributing questionnaires at divisional and departmental meetings. In addition, a small number of questionnaires were obtained individually to complete the equal sample size of 27 for each of the three groups of community college personnel. All questionnaires that were returned in completed form were used in the study.

The Data Analysis

Data obtained from the questionnaires were analyzed at the Oregon State University Computer Center. The questionnaire was designed to solicit two sets of responses. The first set of responses, the interpoint distance estimates, were analyzed using multidimensional scaling analysis. The second set of responses, the preference scores, were analyzed using a one-way analysis of variance procedure.

Multidimensional Scaling Analysis

The interpoint distance estimates were multidimensionally scaled using TORSCA - 9 (1968), a nonmetric MDS computer program

obtained from Forrest Young (see Appendix B) at the University of North Carolina. This program computes a geometric representation of a data matrix (composed of interpoint distance estimates) such that the distances between the points in the representation best reproduce the order of the entries in the data matrix. Essentially this is the problem posed and solved by Shepard (1962a, b).

The data matrix used in the study was the lower triangular mode and consisted of the lower left triangular section of a square symmetric matrix, minus the main diagonal. Therefore, the first data card contained one entry from the second row of the matrix; the second data card contained two entries from the third row, and so on. In all, there were five data cards to represent the combined distance estimates of each group of community college personnel. These combined estimates were obtained by averaging all responses within a group of personnel producing a grand average of 15 interpoint distance estimates for that group. The number of data cards for all three groups of personnel was 15--three groups times five cards per group.

The output data were determined, to some extent, by another card--the problem card. Output data used in the study consisted of:

1. Matrices of original dissimilarities (distance estimates)
2. Matrices of final distances
3. Kruskal's stress
4. Varimax rotated configurations of stimulus coordinates

5. Plots of stimulus coordinates

6. Shepard diagrams of final distances versus original data.

Stimulus coordinates were also plotted on axes that were rotated, translated, and reflected in order to provide a standardized format for presenting the "concept space" established by the MDS process.

Significance Testing of Hypotheses

The present study also determined if quantitative differences existed between three diverse groups of community college personnel regarding six concepts faced by educators. As a result, the null hypotheses tested were: There are no significant differences between the preferences of administrators, academic teachers, and vocational/technical teachers for 1) academic freedom, 2) academic rank, 3) collective bargaining, 4) merit pay, 5) teacher evaluation, and 6) tenure.

A one-way analysis of variance procedure was used in testing for significant differences. The test statistic used to analyze contrasts between mean scores was the F statistic.

One purpose for the significance testing of hypotheses was that it offered a quantitative contrast to the perceived attitude relationships regarding the six concepts. Any significant differences discovered between the various college personnel using the F statistic could be related to possible "differences" between the perceived

attitude structures of these same personnel. Therefore, an external measure of validity of multidimensional scaling was provided. This was important because differences in geometric representations produced by MDS are difficult to express quantitatively.

IV. PRESENTATION OF FINDINGS

This chapter is divided into five main sections. The first section presents the multidimensionally scaled concept space resulting from the perceptions of the administrators. Similarly, the second and third sections present the MDS concept spaces resulting from the perceptions of the academic teachers and vocational/technical teachers respectively.

The fourth section presents a combined geometric representation of the first three sections employing a standardized format to facilitate the comparison of perceptions of the three groups of community college personnel.

The fifth section presents the results of the preference responses of the community college personnel for the six educational concepts that were multidimensionally scaled.

Multidimensional Concept Space - Administrators

This section (as well as sections two and three) begins by presenting the data matrix of interpoint distance estimates that was obtained by the process described in Chapter III. Technically, this matrix (see Table 2) displays concept dissimilarities; that is, larger numbers represent greater dissimilarities between concepts. In addition, the material presented in each of the first three sections is

sequenced in the order that was used to derive the transformed configuration mapping, at the end of each section, from the matrix of original dissimilarities.

Table 2. Original dissimilarities - administrators.

	AF	AR	CB	MP	TE	T
AF	0	1.300	1.550	2.194	3.562	0.880
AR	1.300	0	2.833	2.205	2.909	1.025
CB	1.550	2.833	0	3.477	3.205	1.326
MP	2.194	2.205	3.477	0	0.783	3.433
TE	3.562	2.909	3.205	0.784	0	3.222
T	0.880	1.025	1.326	3.433	3.222	0

The dissimilarities data of Table 2 were coded onto data cards and became the input to TORSCA - 9 for the first phase of the computer routine. These data were then transformed by TORSCA - 9, in a series of intermediate steps, into a matrix of final computer interpoint distances for a specified dimensionality. The matrix in Table 3 represents these final distances for two dimensions.

When the final distances in Table 3 were plotted against the original dissimilarities in Table 2, the following correlation graph, called a Shepard diagram, was the result (see Figure 1). This graph illustrates any departure from a straight-line relationship between the two variables, which would represent a perfect positive correlation.

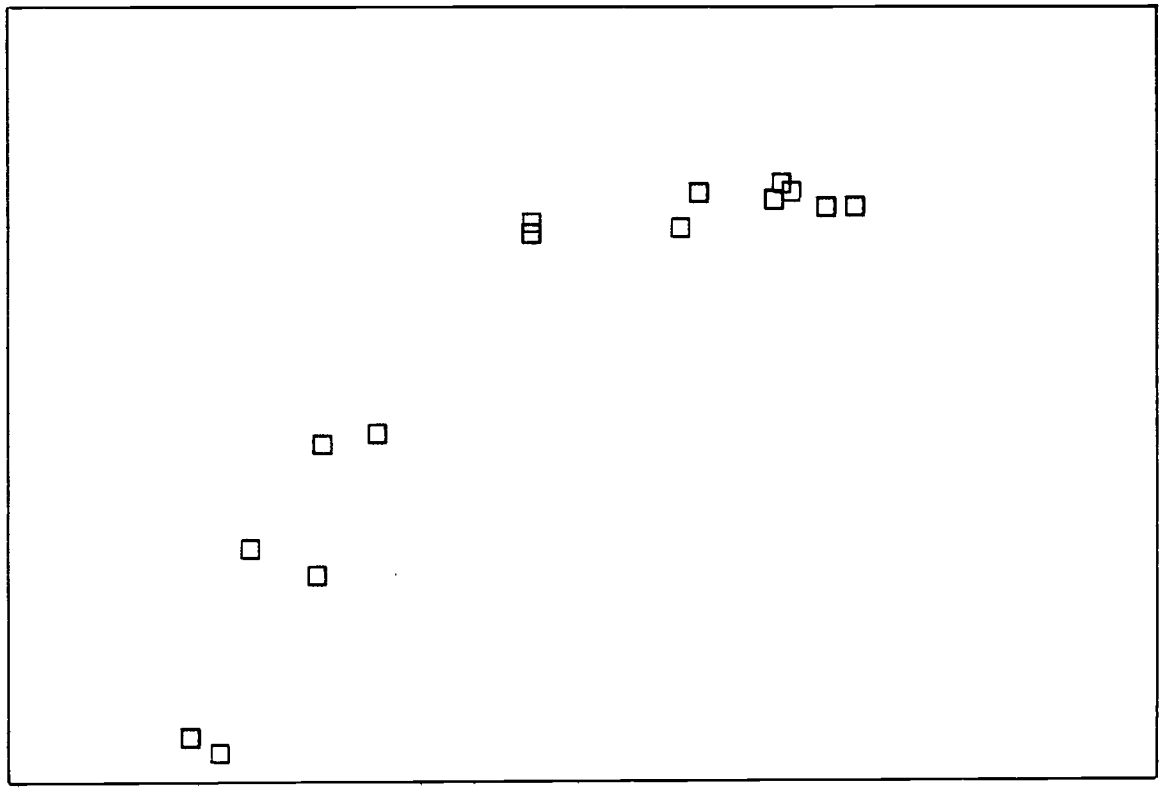

Figure 1. Final distances vs. original dissimilarities - administrators.

Table 3. Final distances - administrators.

	AF	AR	CB	MP	TE	T
AF	0	0.431	0.721	1.146	1.184	0.057
AR	0.431	0	1.128	1.139	1.201	0.481
CB	0.721	1.128	0	1.212	1.199	0.691
MP	1.146	1.139	1.212	0	0.084	1.185
TE	1.184	1.201	1.199	0.084	0	1.220
T	0.057	0.481	0.691	1.185	1.220	0

The two-dimensional coordinates (abscissa and ordinate) that yield the final distances in Table 3 are presented in Table 4. Furthermore, this particular configuration of coordinates was produced by a varimax rotation, which is a standardized way of presenting the stimulus (concept) coordinates.

Table 4. Varimax rotated configuration - administrators.

	Dimension 1	Dimension 2
AF	-0.426	0.044
AR	-0.360	0.471
CB	-0.230	-0.650
MP	0.719	0.104
TE	0.758	0.030
T	-0.462	0.001

Figure 2 illustrates the two-dimensional mapping of the data in Table 4. Dimension 1 is plotted as the abscissa and Dimension 2 is plotted as the ordinate for each concept.

The data in Table 4 were further transformed by allowing academic rank (AR) to determine the ordinate and collective bargaining (CB) and merit pay (MP) to determine the positive and negative abscissa respectively. The transformation equations for these data were

$$x' = -(x - 0.232) \cos 38.5^{\circ} - (y + 0.279) \sin 38.5^{\circ}$$

$$y' = (y + 0.279) \cos 38.5^{\circ} - (x - 0.232) \sin 38.5^{\circ}$$

Table 5 represents the new coordinates based upon the above transformation equations.

Table 5. Transformed configuration - administrators.

	Dimension 1	Dimension 2
AF	0.314	0.662
AR	0	0.955
CB	0.593	0
MP	-0.620	0
TE	-0.604	-0.086
T	0.369	0.651

Figure 3 illustrates the two-dimensional mapping of the data in Table 5.

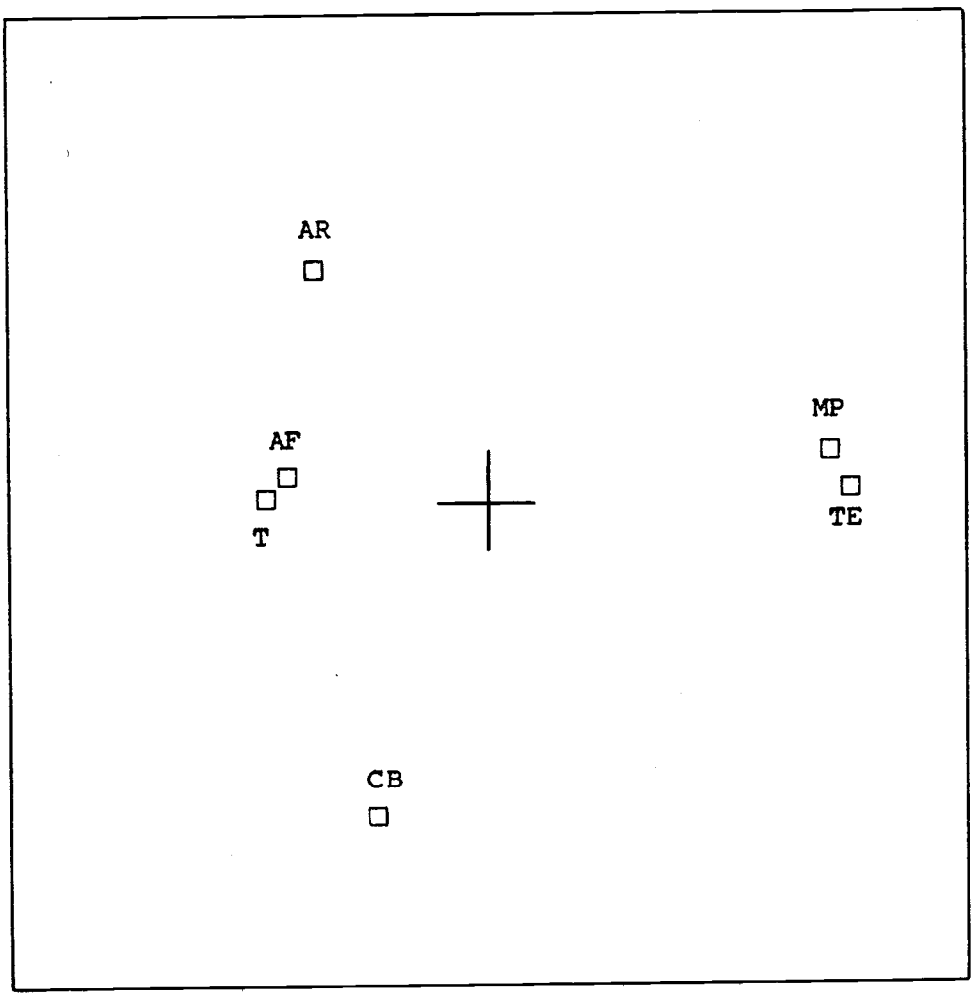

Figure 2. Varimax rotated configuration mapping - administrators.

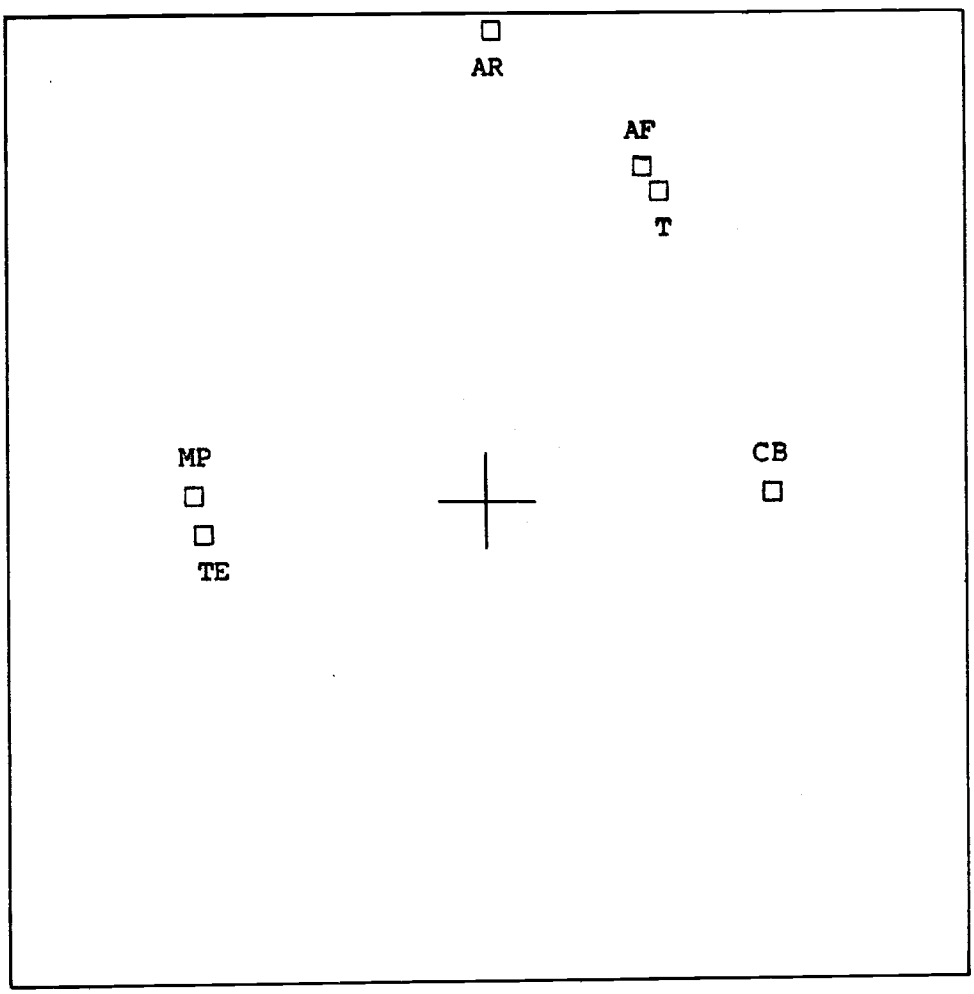

Figure 3. Transformed configuration mapping - administrators.

As a final measure of the goodness-of-fit of the final distances, Kruskal's stress was computed. For the previous data,

Kruskal's stress = 0.014 .

This figure compares well to an ideal stress of zero.

Multidimensional Concept Space - Academic Teachers

This section presents the data obtained from the academic teachers. Furthermore, the order and format used in this section will be identical to the previous section, beginning with the concept dissimilarities represented in Table 6.

Table 6. Original dissimilarities - academic teachers.

	AF	AR	CB	MP	TE	T
AF	0	2.059	0.480	3.952	2.500	0.981
AR	2.059	0	3.722	2.583	2.675	1.342
CB	0.480	3.722	0	4.524	2.211	1.238
MP	3.952	2.583	4.524	0	1.105	3.618
TE	2.500	2.675	2.211	1.105	0	2.283
T	0.981	1.342	1.238	3.618	2.283	0

The matrix in Table 7 represents the final distances that were derived by TORSCA - 9 for two dimensions.

Figure 4 is the Shepard diagram of the data matrices of Tables 6 and 7.

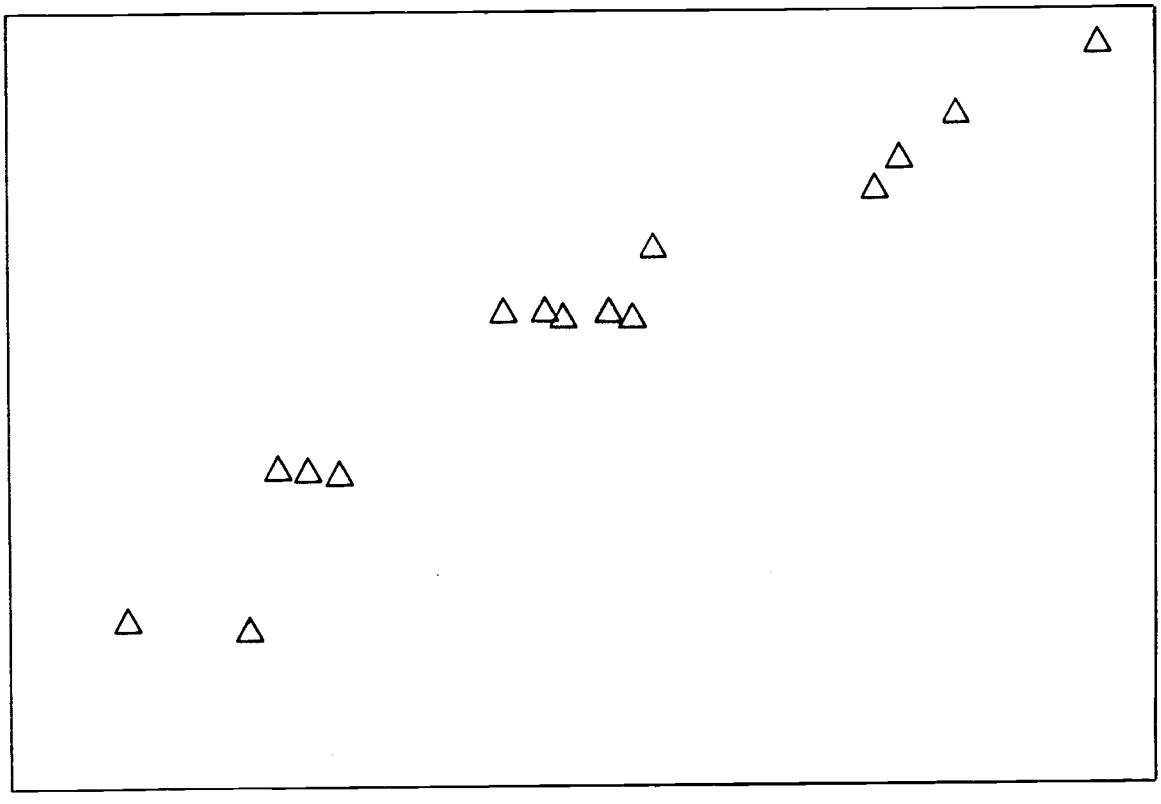

Figure 4. Final distances vs. original dissimilarities - academic teachers.

Table 7. Final distances - academic teachers.

	AF	AR	CB	MP	TE	T
AF	0	0.980	0.340	1.397	0.976	0.331
AR	0.980	0	1.286	0.975	1.116	0.657
CB	0.340	1.286	0	1.525	0.979	0.661
MP	1.397	0.975	1.525	0	0.663	1.236
TE	0.976	1.116	0.979	0.663	0	0.975
T	0.331	0.657	0.661	1.236	0.975	0

Table 8 represents the varimax rotated configuration of coordinates that determined the final distances in Table 7.

Table 8. Varimax rotated configuration - academic teachers.

	Dimension 1	Dimension 2
AF	0.413	-0.307
AR	-0.565	-0.371
CB	0.696	-0.118
MP	-0.649	0.601
TE	0.013	0.584
T	0.092	-0.388

Figure 5 illustrates the two-dimensional mapping of the data in Table 8.

The data in Table 8 were also transformed (as in the first section) by allowing academic rank (AR) to determine the ordinate

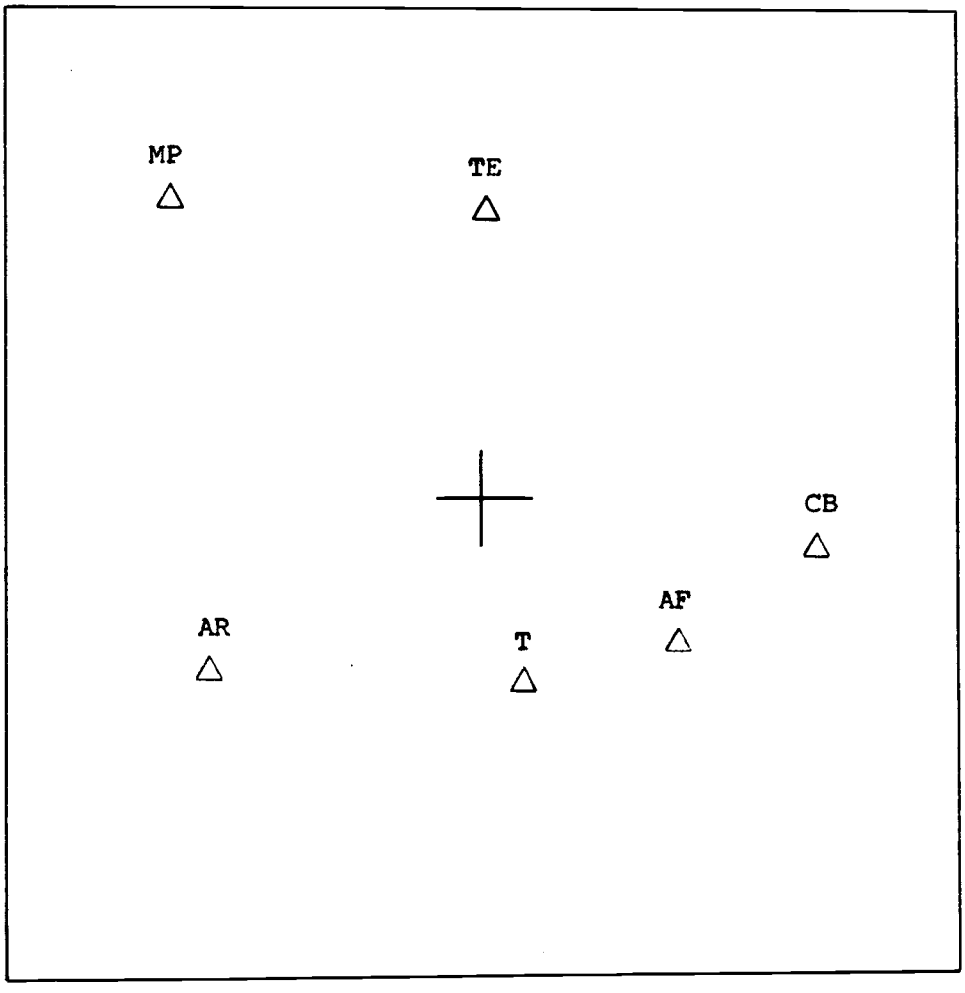

Figure 5. Varimax rotated configuration mapping - academic teachers.

and collective bargaining (CB) and merit pay (MP) to determine the positive and negative abscissa respectively. The transformation equations for these data were

$$x' = -(x + 0.174) \cos 151.7^{\circ} - (y - 0.349) \sin 151.7^{\circ}$$

$$y' = (y - 0.349) \cos 151.7^{\circ} - (x + 0.174) \sin 151.7^{\circ}$$

Table 9 represents the new coordinates based upon the above transformation equations.

Table 9. Transformed configuration - academic teachers.

	Dimension 1	Dimension 2
AF	0.828	0.299
AR	0	0.819
CB	0.987	0
MP	-0.538	0
TE	0.053	-0.296
T	0.584	0.523

Figure 6 illustrates the two-dimensional mapping of the data in Table 9.

Again, as in the previous section, Kruskal's stress was computed. For the previous data,

Kruskal's stress = 0.002 .

This figure is extremely close to an ideal stress of zero.

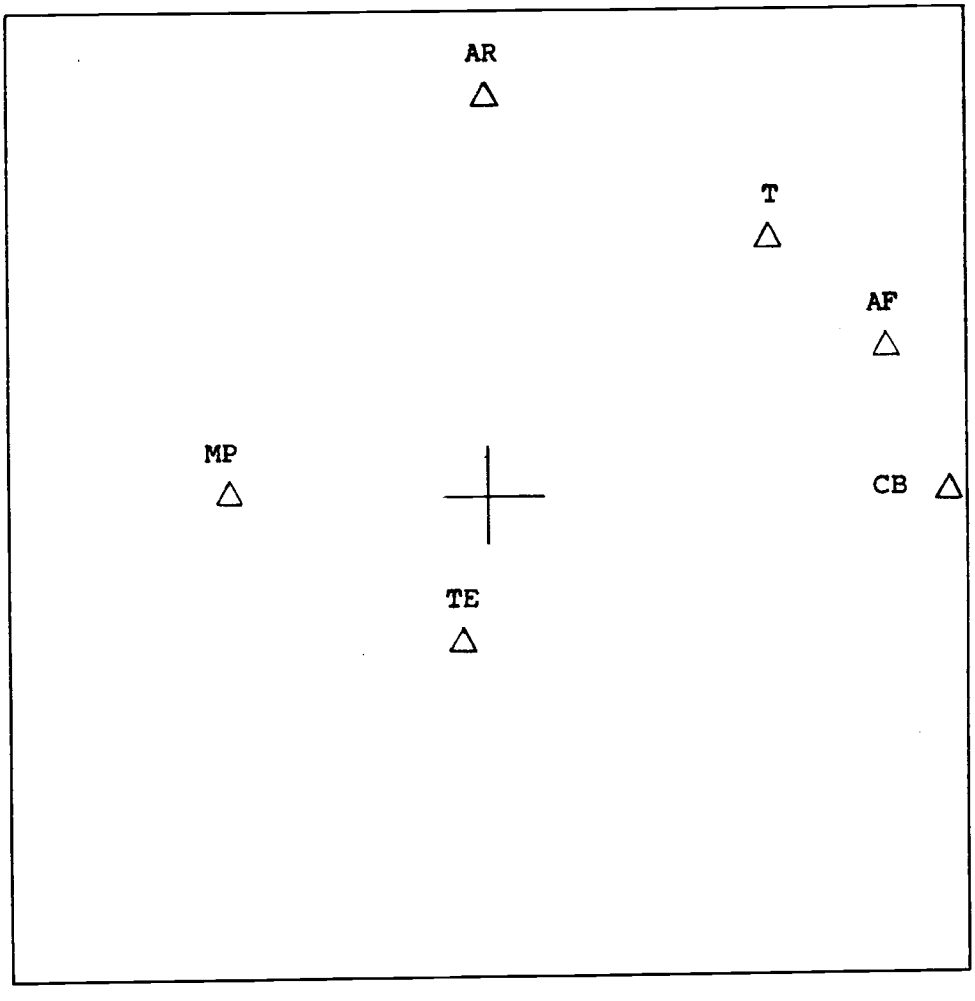

Figure 6. Transformed configuration mapping - academic teachers.

Multidimensional Concept Space - Vocational/Technical Teachers

This section presents the data obtained from the vocational/technical teachers. As in the previous sections, the order and format of the presentation of the data has been preserved. The concept dissimilarities for this group are represented in Table 10.

Table 10. Original dissimilarities - vocational/technical teachers.

	AF	AR	CB	MP	TE	T
AF	0	1.333	1.139	2.667	2.833	1.065
AR	1.333	0	2.382	2.289	3.789	0.750
CB	1.139	2.382	0	3.974	4.469	1.474
MP	2.667	2.289	3.974	0	1.595	3.088
TE	2.833	3.789	4.469	1.595	0	4.469
T	1.065	0.750	1.474	3.088	4.469	0

The next matrix in Table 11 represents the final distances that were derived by TORSCA - 9 for two dimensions.

Figure 7 is the Shepard diagram of the data matrices of Tables 10 and 11.

Table 12 represents the varimax rotated configuration of coordinates that determined the final distances in Table 11.

Figure 8 illustrates the two-dimensional mapping of the data in Table 12.

Table 11. Final distances - vocational/technical teachers.

	AF	AR	CB	MP	TE	T
AF	0	0.518	0.511	0.886	1.101	0.511
AR	0.518	0	0.825	0.825	1.335	0.376
CB	0.511	0.825	0	1.395	1.559	0.540
MP	0.886	0.825	1.395	0	0.698	1.157
TE	1.101	1.335	1.559	0.698	0	1.559
T	0.511	0.376	0.540	1.157	1.559	0

Table 12. Varimax rotated configuration - vocational/technical teachers.

	Dimension 1	Dimension 2
AF	-0.219	0.007
AR	0.088	-0.410
CB	-0.700	-0.167
MP	0.646	0.199
TE	0.462	0.872
T	-0.276	-0.501

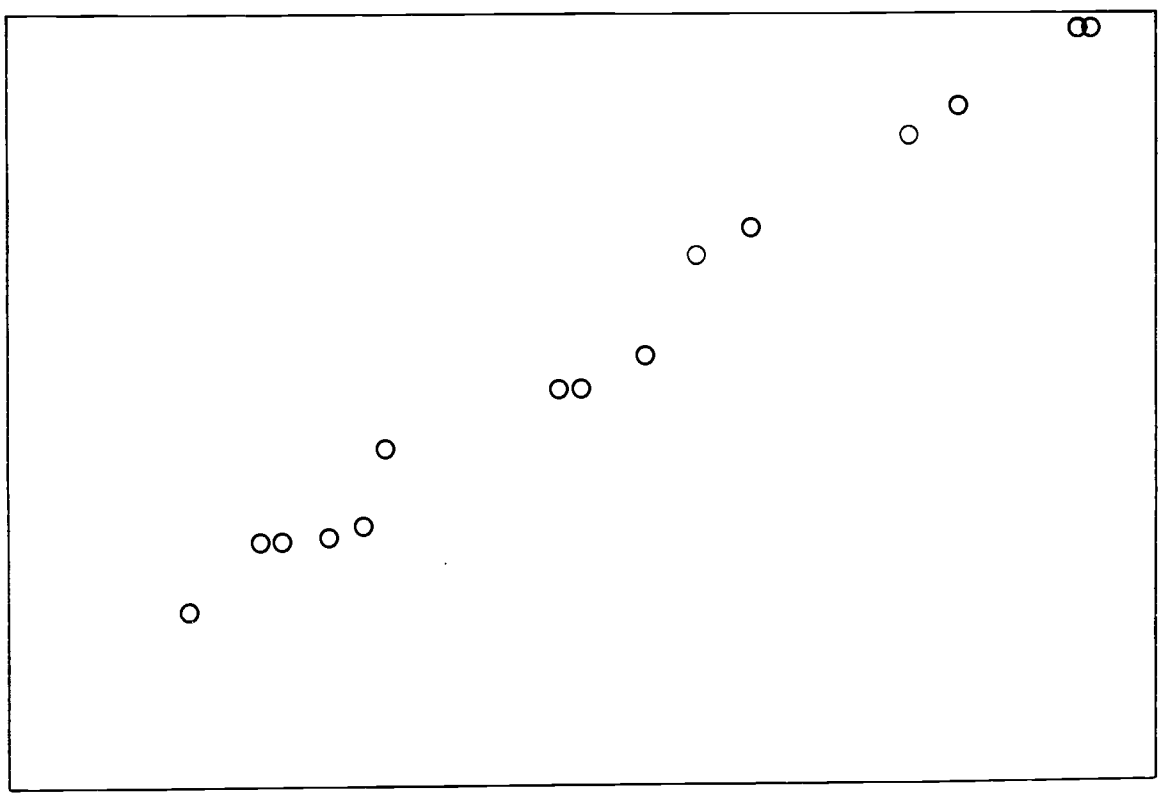

Figure 7. Final distances vs. original dissimilarities - vocational/technical teachers.

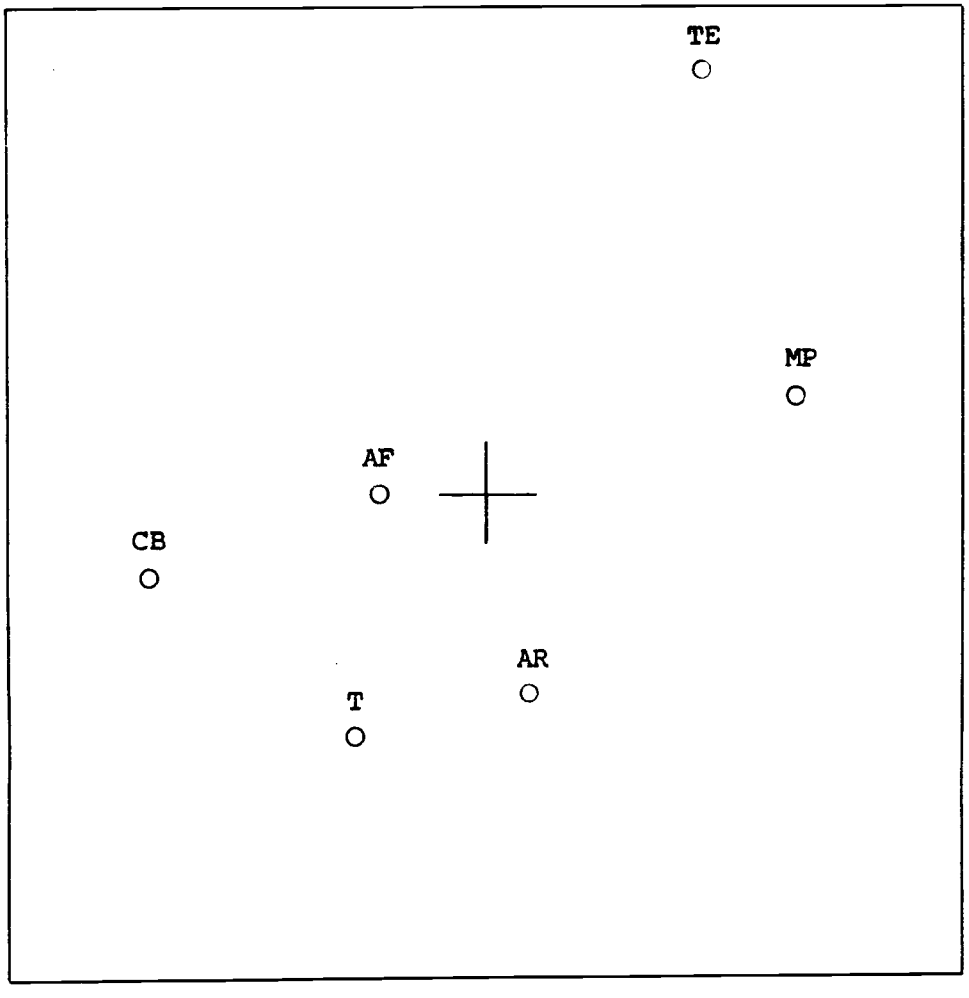

Figure 8. Varimax rotated configuration mapping - vocational/technical teachers.

The data in Table 12 were transformed using the same criteria employed in the previous sections. The transformation equations for these data were

$$x' = -(x + 0.029) \cos 15.2^{\circ} - (y - 0.018) \sin 15.2^{\circ}$$

$$y' = -(y - 0.018) \cos 15.2^{\circ} + (x + 0.029) \sin 15.2^{\circ}$$

Table 13 represents the new coordinates based upon the above transformation equations.

Table 13. Transformed configuration - vocational/technical teachers.

	Dimension 1	Dimension 2
AF	0.186	-0.039
AR	0	0.444
CB	0.696	0
MP	-0.699	0
TE	-0.698	-0.695
T	0.374	0.436

Figure 9 illustrates the two-dimensional mapping of the data in Table 13.

Once again, Kruskal's stress was computed. For the previous data,

Kruskal's stress = 0.000 .

This figure indicates an ideal stress of zero was achieved.

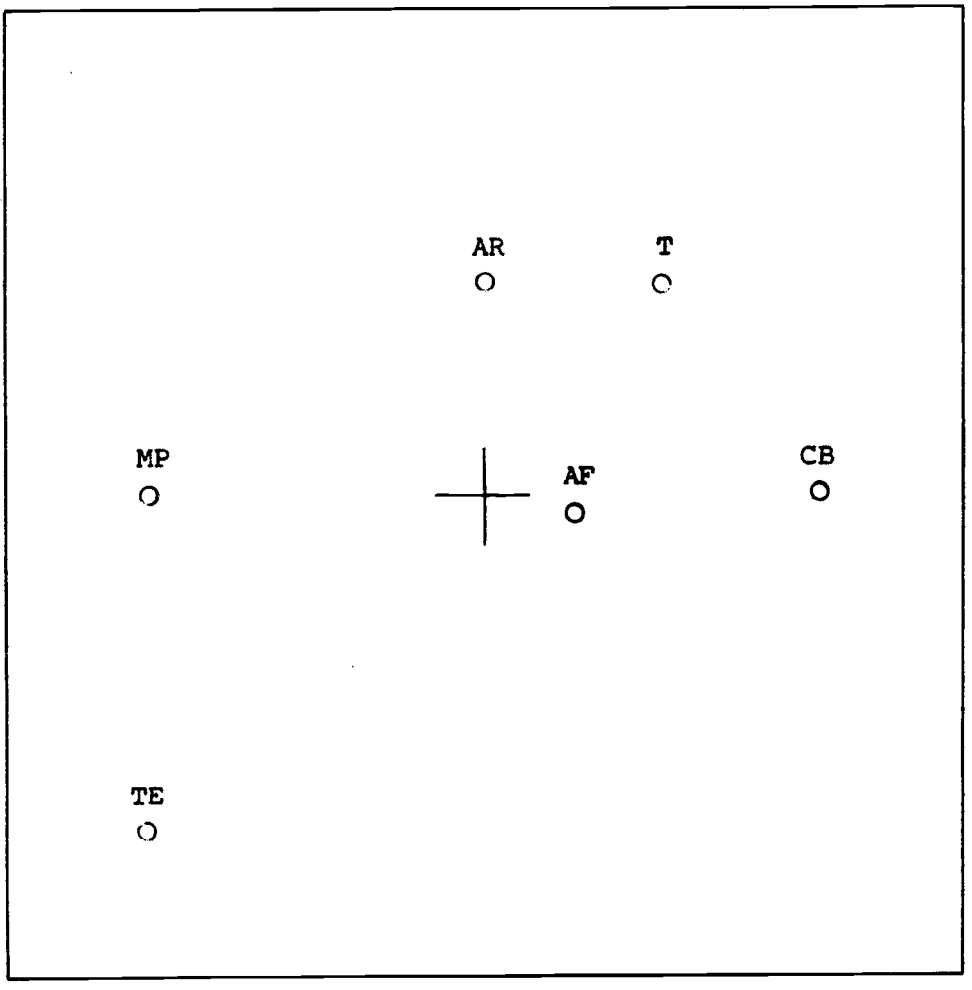

Figure 9. Transformed configuration mapping - vocational/technical teachers.

Combined Multidimensional Concept Space

The purpose of this section was to present a combined configuration mapping of all three groups of community college personnel using identical transformation criteria. This procedure allowed a comparison of the three different concept spaces by establishing three common anchor points for dimensions one and two--namely academic rank (AR), collective bargaining (CB), and merit pay (MP). Furthermore, because the transformations were linear, none of the spatial relationships among the concept coordinates were altered.

The reason that collective bargaining and merit pay were selected to anchor the first dimension was that they appeared to be the two concepts most in opposition. An individual who strongly agreed with the concept of merit pay could be expected to strongly disagree with the concept of collective bargaining (and vice versa). And because these two concepts are intimately related to economic issues, academic rank was selected as the most neutral concept (at Portland Community College) related to economic issues. As such, academic rank was selected to anchor the opposing second dimension producing Figure 10.

Because the coordinates for academic freedom, teacher evaluation, and tenure appeared to describe similar triangles in Figure 10, another dimension besides academic rank was sought using linear regression.

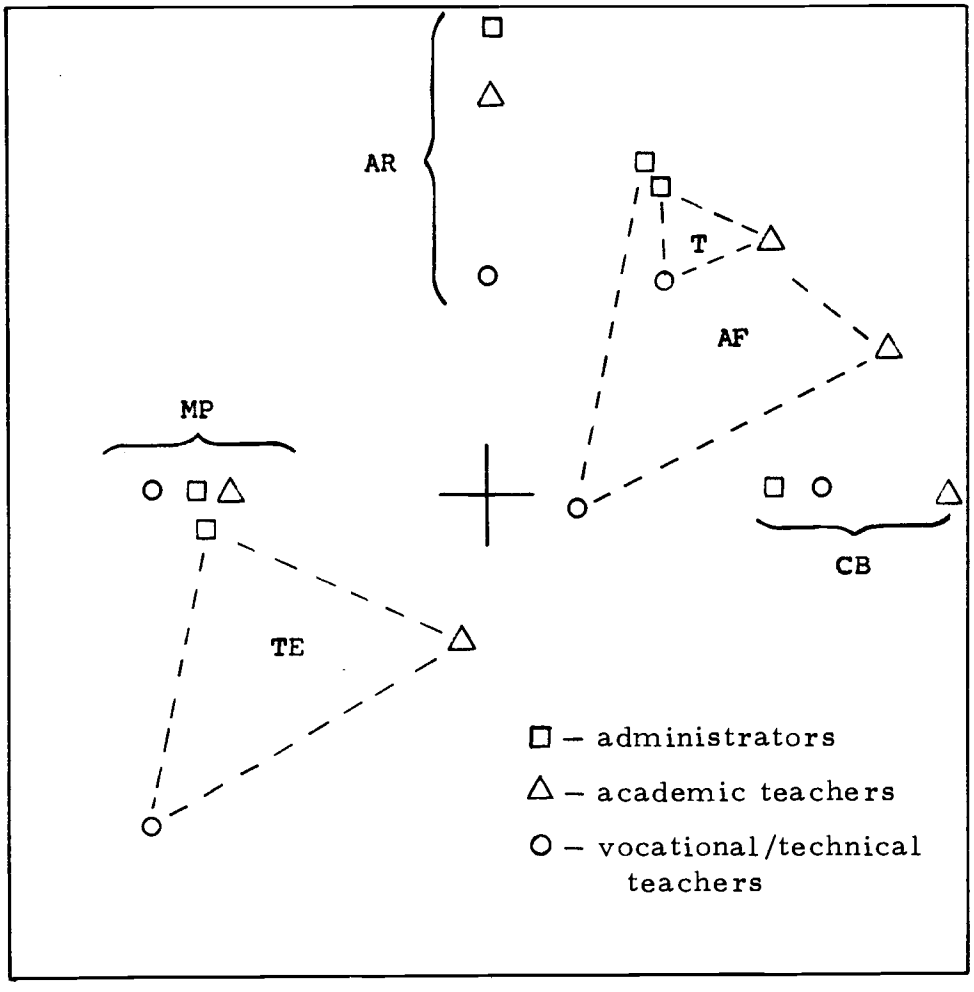

Figure 10. Combined configuration mapping.

For each group of community college personnel--administrators, academic teachers, and vocational/technical teachers--a least squares fit was computed (using AF, TE, and T) to determine the angle formed by the resulting dimension and the CB-MP dimension. These angles are presented in Table 14.

Table 14. Dimensional angles of community college personnel.

Administrators	38.0°
Academic teachers	41.7°
Vocational/technical teachers	43.7°
Combined mean	41.1°

Because the angles formed by this new dimension were in close agreement, a mean angle of 41° was plotted against the CB-MP dimension. By further translating the abscissa to produce congruence of this new dimension among the three groups of community college personnel, the concept space of Figure 11 was produced.

The concept space of Figure 11 represents the culmination of the first four sections related to multidimensional scaling. This mapping illustrates the relationships between all six educational concepts, as perceived by the administrators, academic teachers, and vocational/technical teachers. An analysis of these relationships will be presented in Chapter V.

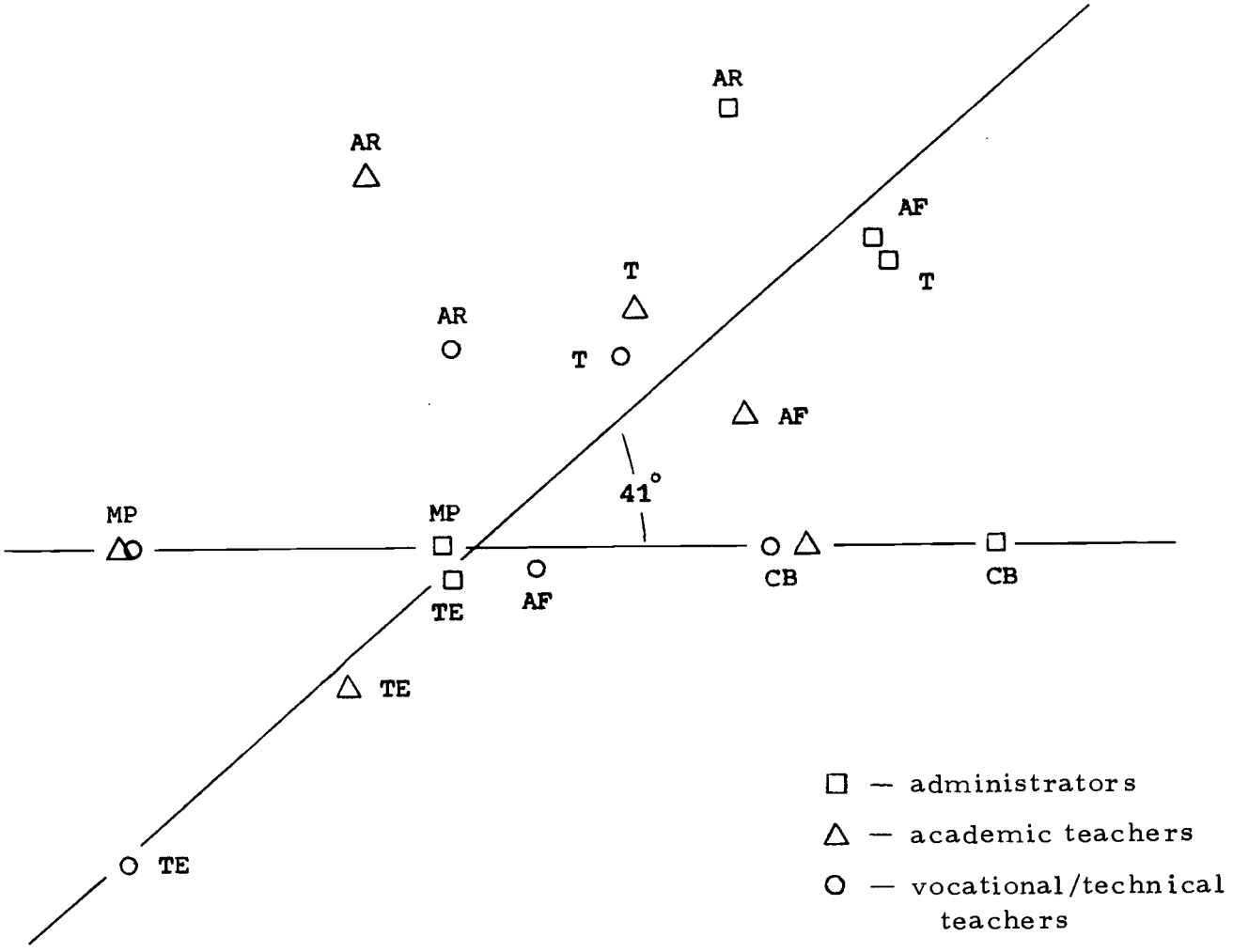

Figure 11. Combined dimensional mapping of concept spaces.

Significance Testing of Preference Responses

This section presents the results of the significance testing of preference scores of the three groups of community college personnel. A one-way analysis of variance procedure was employed to analyze contrasting mean scores among groups; in all cases, the level of significance was established at one percent (see Table 15).

Table 15. Significant differences among community college personnel.

Educational concept	Mean scores			Computed F	Table F*
	Admin.	Academic teachers	Voc. /tech. teachers		
AF	4.30	5.67	4.26	6.81	4.92
AR	1.56	2.41	3.00	5.11	4.92
CB	2.56	5.33	1.74	34.62	4.92
MP	4.30	1.15	4.15	25.52	4.92
TE	5.56	3.93	4.67	6.72	4.92
T	3.04	5.07	2.44	13.65	4.92

*Level of significance - 0.01, degrees of freedom - 2, 70.

In all cases, as discerned from Table 15, differences were present among the community college personnel--at the 0.01 level. Large differences in preference for collective bargaining, merit pay, and tenure were revealed indicating that individual scores tended to be clustered near the ends of the scale used for preference responses. However, it has been demonstrated that the distribution of responses can be skewed to a rather high degree without affecting the significance test (Cochran, 1947).

To determine where the differences were, Scheffe's test was applied. Table 16 illustrates the F ratios established by comparing two group means at a time.

Table 16. Significant differences between group means.

Educational concept	Computed F			Table F*
	Admin. vs Academic teachers	Admin. vs Voc. /tech. teachers	Voc. /tech. teachers vs Academic teachers	
AF	9.96	0.01	10.50	9.84
AR	3.51	10.11	1.70	9.84
CB	37.62	3.24	62.95	9.84
MP	40.07	0.09	36.39	9.84
TE	13.42	3.99	2.77	9.84
T	14.89	1.26	24.82	9.84

*Level of significance - 0.01, degrees of freedom - 2, 70.

As revealed in Table 16, differences were present (at the 0.01 level) between the preferences of administrators and academic teachers for every concept except academic rank. On the other hand, this concept did produce a significant difference between the vocational/technical teachers and administrators. Interestingly enough, however, only the concept of academic rank produced a significant difference between these two groups of personnel--the one concept that is not formally used at Portland Community College.

V. SUMMARY, CONCLUSIONS, AND IMPLICATIONS

The Problem Restated

The objectives of the study were:

1. To determine whether perceived attitudes relationships related to the educational concepts of academic freedom, academic rank, collective bargaining, merit pay, teacher evaluation, and tenure could be multidimensionally scaled.
2. To identify the relevant dimensions of the concept space as perceived by selected community college personnel.
3. To determine whether the concept space was different for administrators, academic teachers, or vocational/technical teachers.
4. To determine whether significant differences existed between community college personnel in their preference for the above educational concepts.
5. To investigate the extent to which qualitative correlations could be established between perceived attitude relationships and preferences for the above educational concepts among the community college personnel.

Procedures

Data for the study were gathered by means of a questionnaire which paired the six educational concepts, using the method of successive intervals, in order to provide the dissimilarities information needed for the multidimensional scaling routine. In addition, preference scores were obtained regarding the six concepts.

The questionnaire was administered to a sample of 27 administrators, 27 academic teachers, and 27 vocational/technical teachers employed by Portland Community College. The respondents were asked to 1) imagine a community college teacher who strongly agrees with a given concept and then indicate the extent of this teacher's agreement or disagreement with a paired concept, and 2) to indicate their degree of preference for each concept.

The data were analyzed at the Oregon State University Computer Center using TORSCA - 9, a nonmetric computer program for MDS, and one-way analysis of variance. Additional transformations of the data were done at Portland Community College on a terminal connected to the Multnomah County Intermediate Education District computer.

The concept spaces established by each group of community college personnel were presented as two-dimensional mappings. Furthermore, combined concept spaces were mapped to facilitate comparisons made between groups.

The preference scores for each group of community college personnel were averaged (by educational concept) and listed in table form along with the corresponding F values.

Summary of Findings

With respect to the first objective of the study (see p. 87) regarding the application of MDS to perceived attitude relationships, an examination of the computer output produced by TORSCA - 9 revealed the following details:

1. All three concept spaces, as perceived by the Portland Community College personnel, were adequately represented in two dimensions using multidimensional scaling analysis.
2. Kruskal's stress--the measure of how well the six educational concepts "fit" into two-dimensional space--was 0.014, 0.002, and 0.000 for the administrators, academic teachers, and vocational/technical teachers respectively.
3. The Shepard diagrams, which plotted final distances (obtained using MDS) against original concept dissimilarities, also demonstrated the linear relationship allowed by two-dimensional space. Some curvilinearity was noted in the administrator diagram, corresponding to the relatively higher value of Kruskal's stress for the administrators of 0.014.

Linear transformations of the two-dimensional concept coordinate points produced by the varimax rotation of TORSCA - 9 revealed the following axes or dimensions (second objective):

1. The concepts selected a priori to anchor one dimension--collective bargaining (CB) and merit pay (MP)--appears to be justified. Of the 15 final distances derived by TORSCA - 9 for each of the three groups of personnel, this distance (CB to MP) was maximum for the academic teachers (1.525), second from maximum for the administrators (1.212), and third from maximum for the vocational/technical teachers (1.395).
2. When academic rank (AR) was initially selected to anchor a second orthogonal dimension, because of its relative freedom from economic influence at Portland Community College, the resultant cluster of concepts (CB, MP, and T) in the combined configuration mapping (Figure 10) was encouraging. Furthermore, the AR axis did appear to approximately bisect the averaged distance between the CB and MP clusters.
3. Because the AR dimension was difficult to label and the remaining concepts (AF, TE, and T) appeared to describe similar triangles whose corresponding vertices described approximately equal first-to-third quadrant angles with the CB-MP axis, a least squares fit was computed to determine these angles. The angles were 38.0°, 41.7°, and 43.7° for the administrators,

academic teachers, and vocational/technical teachers respectively. Because these angles were in such close agreement, a mean angle of 41^{o} was plotted to form an oblique axis with respect to the CB-MP axis (Figure 11).

4. The dimensions of Figure 11 were somewhat difficult to label. The axis anchored by CB on the right and MP on the left most likely represents an economic dimension. However, the contrasts provided by this dimension have more to do with method than results. Merit pay is more apt to be an individual approach to economic matters while collective bargaining represents a group effort concerning economic matters. With this idea in mind, the CB-MP axis was interpreted as representing an economic methodology dimension.

5. The oblique axis was anchored jointly by AF and T in the first quadrant and by TE in the third quadrant. A first impulse was to label this dimension as "accountability" with AF and T representing a more autonomous instructional posture having less inherent accountability contrasted with TE representing less instructional autonomy with increased accountability. This idea was discarded, however, because academic freedom and tenure are not necessarily considered synonomous with "little accountability." Instead, this dimension was labeled academic traditionalism with academic freedom and tenure

representing more academic traditionalism and teacher evaluation representing less academic traditionalism. And while this label may be no more defensible than "accountability," it appeared more plausible to associate the concept of teacher evaluation with decreased academic traditionalism than to associate the concepts of academic freedom and tenure with decreased accountability.

An examination of the combined dimensional mapping of the concept spaces of the three groups of community college personnel (Figure 11) initiated the following observations (third objective):

1. The basic concept space mapped onto the CB-MP axis and the oblique AF, T-TE axis was the same for all three groups of community college personnel. All groups perceived a relative similarity between the concepts of academic freedom and tenure (more academic traditionalism) and the concept of collective bargaining (group economic methodology). Likewise, they perceived a relative similarity between the concept of teacher evaluation (less academic traditionalism) and the concept of merit pay (individual economic methodology).
2. One fact worth noting is that although all three concept spaces produce the same axes or dimensions, the concept coordinate points, resulting from the different groups of community college personnel, reflect their different perceptions of concept

similarities. For instance, the administrators perceive the concepts of merit pay and teacher evaluation to be far more similar than either of the other two groups perceive them.

3. Therefore, when questioning whether the concept space was different for administrators, academic teachers, or vocational/technical teachers, the answer must be "yes and no"; yes--when referring to the interpoint relationships among the concepts, and no--when referring to the basic dimensions of the concept space.

An analysis of the F tests (Tables 5 and 6) resulted in the following details regarding significant differences in preference among the community college personnel for the six educational concepts (fourth objective):

1. Initial F tests, which contrasted all three mean scores for concept preference (one concept at a time), revealed that significant differences existed among the community college personnel. Furthermore, these differences were significant at the 0.01 level for every concept!
2. To determine where the differences existed within the personnel preference scores, Scheffe's test was applied. Between the administrators and academic teachers, there were significant differences between all concept preference scores except for academic rank. Again, these differences were all significant at the 0.01 level.

3. Between the administrators and vocational/technical teachers, no significant differences existed between preference scores except for academic rank. While the vocational/technical teachers were merely neutral in their preference scores for academic rank (3.00), the administrators were overwhelmingly lower in their preference scores for this concept (1.56).

4. When contrasting the vocational/technical teachers with the academic teachers, significant differences between preference scores (at the 0.01 level) were present for every concept except academic rank and teacher evaluation. Although the vocational/technical teachers preferred the concept of teacher evaluation over the academic teachers 4.67 to 3.93, the difference was not significant.

5. In general, then, the administrators and vocational/technical teachers are in close agreement in their preference scores for the six educational concepts--with the single exception of academic rank. Furthermore, both of these groups differ significantly with the academic teachers regarding their preference scores for these same educational concepts.

6. Finally, one irony worthy of note is that the highest F value (62.95) occurred when contrasting the teacher preference scores for collective bargaining. This score resulted from a mean preference score of 5.33 for the academic teachers and 1.74 for the vocational/technical teachers.

A comparison of the combined dimensional mapping of the group concept spaces (Figure 11) with the significant differences among group mean preference scores (Table 15) produced the following qualitative correlations (fifth objective):

1. The academic teachers had a relatively low preference score for teacher evaluation (3. 93) which appears confusing when one considers that a large number of academic teachers at the community college are professionally trained teachers who should welcome evaluation as an aid to improvement of instruction. However, this same group of teachers are in strong disagreement with the concept of merit pay and may be anticipating the administrators' perceived similarity between the concepts of merit pay and teacher evaluation as indicated in Figure 11.
2. The administrators appear to place the concepts of academic freedom, academic rank, and tenure well out on the (more) academic traditionalism axis which appears to correlate with their relatively low preference scores (4. 30, 1. 56, and 3. 04 respectively) for these concepts. In other words, they are relatively cool toward concepts that they perceive to be related to academic traditionalism.
3. The vocational/technical teachers also tend not to prefer the concepts of academic freedom, academic rank, and tenure (4. 26, 3. 00, and 2. 44 respectively). However, in contrast to

the administrators, they do not perceive these concepts to be as strongly related to academic traditionalism. Apparently, their lack of preference for these concepts does not stem out of a general rejection for academic traditionalism.

4. With respect to teacher evaluation, the vocational/technical teachers placed this concept well out on the (less) academic traditionalism axis. They appear to believe that professional educators have not been concerned with instructional accountability in the past. To a lesser degree, academic teachers appear to share this view. The administrators, by contrast, perceived the concept of teacher evaluation as being neutral with respect to the academic traditionalism axis.

5. A relatively strong similarity between the concepts of academic freedom and collective bargaining was indicated by the academic teachers in Figure 11. In fact, they perceived the concept of academic freedom to share attributes of both (more) academic traditionalism and group economic methodology--a perception that was unique. However, when one considers their high preference scores for these concepts (academic freedom - 5.67 and collective bargaining - 5.33), this does not seem surprising.

Conclusions

Based on the review of literature and the results of data analysis,

the following conclusions have been drawn from the study.

1. Multidimensional scaling analysis represents a viable instrument for measuring and analyzing attitudes and attitude structures in an educational setting.
   a. MDS avoids the arbitrary restrictions imposed by unidimensional instruments for assessing attitudes.
   b. Nonmetric MDS does not make assumptions regarding the distributional and metric properties of the data.
   c. Two-dimensional mappings (two axes at a time) present an understandable graphical relationship that may exist between many stimuli that share common attributes.
2. Community college personnel, while differing dramatically in their preference for the six educational concepts presented in the study, all structure these concepts in a space that can be represented by two dimensions--academic traditionalism and economic methodology.
3. The axes that represent the two dimensions that emerged in the study are not orthogonal; rather, they form an oblique angle of approximately 41^{o} with one another. In fact, true orthogonality between two dimensions may be a relatively rare occurrence when using MDS analysis.
4. Community college personnel tend to divide into two factions: 1) conservative personnel who prefer academic traditionalism

(academic teachers in the study), and 2) liberal personnel who do not prefer academic traditionalism (administrators and vocational /technical teachers in the study).

5. A one-way analysis of variance does provide data that allows a more meaningful interpretation of the MDS data and the resulting concept spaces. Furthermore, when testing for significant differences, the F statistic yields a quantitative result--which MDS does not.

Implications

In view of the findings and conclusions drawn from the study, the following implications, regarding MDS, are offered:

1. Multidimensional scaling analysis should be adopted by educators as an instrument to assist them in assessing attitudes and attitude structures.
2. When possible, MDS should be employed jointly with preference data to assist in interpreting the data yielded by the MDS routine.

With respect to specific findings of the study regarding community college personnel these additional implications are offered:

1. In view of the fact that all three groups of personnel at Portland Community College tend not to prefer the concept of academic rank, this system should not be adopted.
2. Collective bargaining will continue to be a contested issue at

the community college; adoption of this concept will probably be decided by the relative percentage of faculty that are either academic teachers or vocational/technical teachers. Because of the strong feelings (both pro and con) regarding this concept, and its potential divisiveness, care should be taken to emphasize the positive aspects of collective bargaining to minimize possible friction between faculty members.

3. Administrators who wish to promote teacher evaluation must disassociate this concept from merit pay if they want better acceptance of teacher evaluation on the part of academic teachers. Although the administrators prefer merit pay (with a score of 4.30), they have a stronger preference for teacher evaluation (with a score of 5.56)--indicating a compromise on these concepts may be in order.

Suggestions for Further Study

1. The present study should be replicated at other community colleges--both in and out of Oregon--to determine if the perceived concept spaces of other personnel, on other campuses, are relatively independent of their preferences and are comprised of the same dimensions. The study should also be replicated at four-year colleges and universities to determine if perceived concept spaces of university personnel are different from community college personnel.

2. Other educational MDS studies should be initiated using different stimuli. For example, MDS might be employed to detect any expanded concept of "work" due to career education in the elementary and secondary schools. This could be done by contrasting various occupations and asking the student to rate perceived similarities between them.

3. Additional MDS programs (such as PREFMAP which fits overall preferences, at the individual level, to the average-subject solutions) should be investigated for possible adaptability to educational settings. This type of analysis might be used to determine both positive and negative attributes of an "ideal" teacher as perceived by various community college personnel.

BIBLIOGRAPHY

Abelson, R. P., "A Technique and a Model for Multidimensional Attitude Scaling," Public Opinion Quarterly, vol. 18 (1954), pp. 405-418.

"Academic Freedom and Tenure, 1940 Statement of Principles," AAUP Bulletin, vol. 49 (June, 1963), pp. 192-193.

Blocker, C. E., R. H. Plummer, and R. C. Richardson, Jr., The Two-Year College: A Social Synthesis. Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1965.

Bogardus, E. S., "Social Distance and its Origins," Journal of Applied Psychology, vol. 9 (1925), pp. 216-226.

Bogardus, E. S., Immigration and Race Attitudes. Boston: Heath, 1928.

Bechtel, G. G., L. R. Tucker, and W. Chang, "A Scalar Product Model for the Multidimensional Scaling of Choice," Psychometrika, vol. 36 (1971), pp. 369-388.

Burton, M., "Semantic Dimensions of Occupation Names," in R. N. Shepard, A. K. Romney, and S. B. Nerlove, eds., Multidimensional Scaling: Theory and Applications in the Behavioral Sciences. 2 vols. New York: Seminar Press, 1972.

Campbell, D. T., "The Indirect Assessment of Social Attitudes," Psychological Bulletin, vol. 47 (1950), pp. 15-38.

Cochran, W. G., "Some Consequences when the Assumptions Underlying the Analysis of Variance Have Not Been Met," Biometrics, vol. 3 (1947), pp. 22-28.

Coombs, C. H., A Theory of Data. New York: John Wiley & Sons, Inc., 1964.

Cooper, J. B., and H. E. Siegel, "The Galvanic Skin Response as a Measure of Emotion in Prejudice," Journal of Psychology, vol. 42 (1956), pp. 149-155.

Cooper, J. B., and D. N. Singer, "The Role of Emotion in Prejudice," Journal of Social Psychology, vol. 44 (1956), pp. 241-247.

Cooper, J. B., and D. Pollick, "The Identification of Prejudicial Attitudes by the Galvanic Skin Response," Journal of Social Psychology, vol. 50 (1959), pp. 241-245.

Droba, D. D., "Methods for Measuring Attitudes," Psychological Bulletin, vol. 29 (1932), pp. 309-323.

Dubin, S. S., "Verbal Attitude Scores Predicted from Responses in a Projective Technique," Sociometry, vol. 3 (1940), pp. 24-28.

Egan, D. M., "Evaluating Faculty Performance: An Academic and Managerial Dilemma," Mimeographed Paper presented to the Western Academy of Management in Reno, Nevada on April 13, 1973.

Egan, D. M., "Executive Performance Appraisal: An Application of Nonmetric Multidimensional Scaling," Proceedings of the Academy of Management, (May, 1972), pp. 75-80.

Evanechko, P. O., and T. O. Maguire, "The Dimensions of Children's Meaning Space," American Educational Research Journal, vol. 9 (1972), pp. 485-491.

Fishbein, M., and B. H. Raven, "The AB Scales: An Operational Definition of Belief and Attitude," Human Relations, vol. 15 (1962), pp. 35-44.

Freiberger, H. T., and W. H. Crawford, "Junior College Academic Rank and Title," Junior College Journal, vol. 33 (October, 1962), pp. 89-92.

Frenkel-Brunswik, E., and H. E. Jones (Directors), and M. Rokeach, M. Jarvik, and D. T. Campbell (Staff). Unpublished research on the personality correlates of anti-minority attitudes among grade school children. A project of the University of California Institute of Child Welfare, financed by a grant from the American Jewish Committee, 1946-1947.

Garrison, R. H., Junior College Faculty: Issues and Problems. Washington, D. C.: American Association of Junior Colleges, 1967.

Goodman, L. A., and W. H. Kruskal, "Measures of Association for Cross-Classifications," Journal of the American Statistical Association, vol. 49 (1954), pp. 732-764.

Green, P. E., and V. R. Rao, Applied Multidimensional Scaling; A Comparison of Approaches and Algorithms. New York: Holt, Rinehart & Winston, Inc., 1972.

Guttman, L., "A Basis for Scaling Qualitative Data," American Sociological Review, vol. 9 (1944), pp. 139-150.

Guttman, L., "The Cornell Technique for Scale and Intensity Analysis," Educational and Psychological Measurement, vol. 7 (1947), pp. 247-279.

Guttman, L., "The Principal Components of Scale Analysis," in S. A. Stouffer, ed., Measurement and Prediction. Chapter 6. Princeton, New Jersey: Princeton University Press, 1950.

Hartley, E. L., and S. Schwartz, "A Pictorial Doll-Play Approach for the Study of Children's Intergroup Attitudes," Mimeographed preliminary draft. Research Institute in American Jewish Education, American Jewish Committee, Summer, 1948.

Hendrix, V. L., "Academic Rank: Mostly Peril?" Junior College Journal, vol. 34 (December, 1963), pp. 28-30.

Ikenberry, S. O., "Governance and the Faculty," Junior College Journal, vol. 42 (November, 1971), pp. 12-15.

Johnson, G. G., "An Experimental Analysis of the Origin and Development of Racial Attitudes with Special Emphasis on the Role of Bilingualism," Ph. D. Thesis, University of Colorado, 1949.

Katz, D., and E. Stotland, "A Preliminary Statement to a Theory of Attitude Structure and Change," in S. Koch, ed., Psychology: A Study of a Science. Vol. 3. New York: McGraw-Hill Book Company, 1959.

Kelley, W., and L. Wilbur, Teaching in the Community-Junior College. New York: Appleton-Century-Crofts (Educational Division, Meredith Corporation), 1970.

Kelly, M. F., and J. Connolly, Orientation for Faculty in Junior College Reading Programs. ERIC Clearinghouse for Junior Colleges, Topical Paper No. 18. Los Angeles: University of California, 1971.

Kimball, J. R., "Analysis of Institutional Objectives in Michigan Community Colleges," Ph. D. Thesis, Michigan State University, 1960.

Kruskal, J. B., "Multidimensional Scaling by Optimizing Goodness of Fit to a Nonmetric Hypothesis," Psychometrika, vol. 29 (1964a), pp. 1-27.

Kruskal, J. B., "Nonmetric Multidimensional Scaling: A Numerical Method," Psychometrika, vol. 29 (1964b), pp. 115-129.

Likert, A., "A Technique for the Measurement of Attitudes," Archives of Psychology, No. 140 (1932), pp. 44-53.

Mayhew, L. B., Arrogance on Campus. San Francisco: Josey-Bass Inc., Publishers, 1970.

Medsker, L., The Junior College: Progress and Prospect. New York: McGraw-Hill Book Company, 1960.

Medsker, L., and H. Tillery, Breaking the Access Barriers: A Profile of Two-Year Colleges. New York: McGraw-Hill Book Company, 1971.

Messick, S. J., The Perception of Attitude Relationships: A Multidimensional Scaling Approach to the Structuring of Social Attitudes," Ph. D. Thesis, Princeton University, 1954.

Messick, S. J., "The Perception of Social Attitudes," Journal of Abnormal and Social Psychology, vol. 52 (1956), pp. 57-66.

Messick, S. J., and R. P. Abelson, "The Additive Constant Problem in Multidimensional Scaling," Psychometrika, vol. 21 (1956), pp. 1-15.

Napior, D., "Nonmetric Multidimensional Techniques for Summated Ratings," in R. N. Shepard, A. K. Romney, and S. B. Nerlove, eds., Multidimensional Scaling: Theory and Applications in the Behavioral Sciences. 2 vols. New York: Seminar Press, 1972.

Neidell, L. A., "The Use of Nonmetric Multidimensional Scaling in Marketing Analysis," Journal of Marketing, vol. 33 (1969), pp. 37-43.

Nelson, J. H., "Collective Bargaining: An Instrument for Staff Development," Community and Junior College Journal, vol. 43 (October, 1972), p. 27.

Newcomb, T. M., "The Influence of Attitude Climate upon Some Determinants of Information," Journal of Abnormal and Social Psychology, vol. 41 (1946), pp. 291-302.

O'Banion, T., Teachers for Tomorrow; Staff Development in the Community-Junior College. Tucson, Arizona: The University of Arizona Press, 1972.

Osgood, C. E., G. J. Suci, and P. H. Tannenbaum, The Measurement of Meaning. Urbana: University of Illinois Press, 1957.

Peterson, R. C., Scale for the Measurement of Attitude toward Capital Punishment. Chicago: University of Chicago Press, 1931b.

Peterson, R. C., Scale for the Measurement of Attitude toward War. Chicago: University of Chicago Press, 1931a.

"Policy and Procedure for the Evaluation of Instruction," Portland Community College Policy Manual, II-41 (November 20, 1972), pp. 1-3.

Proshansky, H. A., "A Projective Method for the Study of Attitudes," Journal of Abnormal and Social Psychology, vol. 38 (1943), pp. 383-395.

Rapoport, A., and S. Fillenbaum, "An Experimental Study of Semantic Structures," in R. N. Shepard, A. K. Romney, and S. B. Nerlove, eds., Multidimensional Scaling: Theory and Applications in the Behavioral Sciences. 2 vols. New York: Seminar Press, 1972.

"Regulations on Academic Freedom, Due Process, and Continuous Appointment," Portland Community College Policy Manual, II-23 (May 1, 1972), pp. 1-11.

Richardson, M. W., "Multidimensional Psychophysics," Psychological Bulletin, vol. 35 (1938), pp. 659-660.

Rosenberg, S., and A. Sedlak, "Structural Representations of Perceived Personality Trait Relationships," in R. N. Shepard, A. K. Romney, and S. B. Nerlove, eds., Multidimensional Scaling: Theory and Applications in the Behavioral Sciences. 2 vols. New York: Seminar Press, 1972.

Rotter, J. B., and B. Willerman, "The Incomplete Sentences Tests as a Method of Studying Personality," Journal of Consulting Psychology, vol. 11 (1947), pp. 43-48.

Saffir, M., "A Comparative Study of Scales Constructed by Three Psychophysical Methods," Psychometrika, vol. 2 (1937), pp. 179-198.

Scheffe, H., "A Method for Judging all Contrasts in the Analysis of Variance," Biometrika, vol. 40 (1953), pp. 87-104.

Schulman, B. R., and J. W. Trudell, "California's Guidelines for Teacher Evaluation," Community and Junior College Journal, vol. 43 (October, 1972), pp. 32-34.

Seitz, V. R., "Multidimensional Scaling of Dimensional Preferences: A Methodological Study," Child Development, vol. 42 (1971), pp. 1701-1720.

Shepard, R. N., An introduction to Volume I, in R. N. Shepard, A. K. Romney, and S. B. Nerlove, eds., Multidimensional Scaling: Theory and Applications in the Behavioral Sciences. 2 vols. New York: Seminar Press, 1972.

Shepard, R. N., "The Analysis of Proximities: Multidimensional Scaling with an Unknown Distance Function, Part One," Psychometrika, vol. 27 (1962a), pp. 125-139.

Shepard, R. N., The Analysis of Proximities: Multidimensional Scaling with an Unknown Distance Function, Part Two," Psychometrika, vol. 27 (1962b), pp. 219-246.

Shepard, R. N., A. K. Romney, and S. B. Nerlove, eds., Multidimensional Scaling: Theory and Applications in the Behavioral Sciences. 2 vols. New York: Seminar Press, 1972.

Stefflre, V. J., "Some Applications of Multidimensional Scaling to Social Science Problems," in R. N. Shepard, A. K. Romney, and S. B. Nerlove, eds., Multidimensional Scaling: Theory and Applications in the Behavioral Sciences. 2 vols. New York: Seminar Press, 1972.

Thornton, J. W., The Community Junior College. New York: John Wiley & Sons, Inc., 1972.

Thurstone, L. L., "Psychophysical Analysis," American Journal of Psychology, vol. 38 (1972), pp. 268-389.

Thurstone, L. L., and E. J. Chave, The Measurement of Attitude. Chicago: University of Chicago Press, 1929.

Torgerson, W. S., "A Theoretical and Empirical Investigation of Multidimensional Scaling," Ph. D. Thesis, Princeton University, 1951.

Torgerson, W. S., "Multidimensional Scaling: I. Theory and Method," Psychometrika, vol. 17 (1952), pp. 401-419.

Torgerson, W. S., Theory and Methods of Scaling. New York: John Wiley & Sons, Inc., 1958.

"TORSCA - 9, A FORTRAN IV Program for Nonmetric Multidimensional Scaling," Behavioral Science, vol. 13 (1968), p. 343.

Travers, R. M. W., "A Study in Judging the Opinions of Groups," Archives of Psychology, No 266 (1941).

Triandis, H. C., "Exploratory Factor Analysis of the Behavioral Component of Social Attitudes," Journal of Abnormal and Social Psychology, vol. 68 (1964), pp. 420-430.

Triandis, H. C., and L. M. Triandis, "A Cross-Cultural Study of Social Distance," Psychological Monographs, vol. 76 (1962), no. 540.

Triandis, H. C., and L. M. Triandis, "Race, Social Class, Religion and Nationality as Determinants of Social Distance," Journal of Abnormal and Social Psychology, vol. 61 (1960), pp. 110-118.

Tucker, L. R., "Systematic Differences between Individuals in Perceptual Judgements," in M. W. Shelly and G. L. Bryan, eds., Human Judgements and Optimality. New York: John Wiley & Sons, Inc., 1964.

Tucker, L. R., and S. Messick, "An Individual Differences Model for Multidimensional Scaling," Psychometrika, vol. 28 (1963), pp. 333-367.

Wainer, H., and W. Berg, "The Dimensions of De Maupassant," American Educational Research Journal, vol. 9 (1972), pp. 485-491.

Wallen, R., "Individuals' Estimates of Group Opinion," Journal of Social Psychology, vol. 17 (1943), pp. 269-274.

Wang, C. K. A., "Suggested Criteria for Writing Attitude Statements," Journal of Social Psychology, vol. 3 (1932), pp. 367-373.

Wang, C. K. A., and L. L. Thurstone, Scale for the Measurement of Attitude toward the Treatment of Criminals. Chicago: University of Chicago Press, 1931.

Wish, M., M. Deutsch, and L. Biener, "Differences in Perceived Similarity of Nations," in R. N. Shepard, A. K. Romney, and S. B. Nerlove, eds., Multidimensional Scaling: Theory and Applications in the Behavioral Sciences. 2 vols. New York: Seminar Press, 1972.

Young, G., and A. S. Householder, "Discussion of a Set of Points in Terms of Their Mutual Distances," Psychometrika, vol. 3 (1938), pp. 19-22.

APPENDICES

APPENDIX A

QUESTIONNAIRE

The Perception of Attitudes by Selected Community College Teachers and Administrators: A Multidimensionally Scaled Analysis

PURPOSE OF STUDY

This study intends to apply a technique for measuring attitudes called multidimensional scaling analysis. This questionnaire will provide the necessary information for the study. No names are requested; merely indicate the department you teach in. If you are an administrator, please indicate so.

DIRECTIONS

Imagine the type of community college teacher who strongly agrees with the concept at the top of each page; and then, decide how this same teacher would also feel about the bottom concept in each pairing. Please indicate the extent of this teacher's agreement or disagreement by placing a cross in one of the boxes to the right.

Please indicate the department you teach in. _____
Department

Imagine the type of community college teacher who strongly agrees with

ACADEMIC FREEDOM

and then decide how this same teacher would also feel about the bottom concept in each pairing. Please indicate the extent of this teacher's agreement or disagreement by placing a cross in one of the boxes to the right.

	Strongly disagree			Neutral			Strongly agree
Academic Freedom Academic Rank	( )	( )	( )	( )	( )	( )	( )
Academic Freedom Tenure	( )	( )	( )	( )	( )	( )	( )
Academic Freedom Teacher Evaluation	( )	( )	( )	( )	( )	( )	( )
Academic Freedom Collective Bargaining	( )	( )	( )	( )	( )	( )	( )
Academic Freedom Merit Pay	( )	( )	( )	( )	( )	( )	( )

Imagine the type of community college teacher who strongly agrees with

COLLECTIVE BARGAINING

and then decide how this same teacher would also feel about the bottom concept in each pairing. Please indicate the extent of this teacher's agreement or disagreement by placing a cross in one of the boxes to the right.

	Strongly disagree			Neutral			Strongly agree
Collective Bargaining Teacher Evaluation	( )	( )	( )	( )	( )	( )	( )
Collective Bargaining Merit Pay	( )	( )	( )	( )	( )	( )	( )
Collective Bargaining Academic Rank	( )	( )	( )	( )	( )	( )	( )
Collective Bargaining Tenure	( )	( )	( )	( )	( )	( )	( )
Collective Bargaining Academic Freedom	( )	( )	( )	( )	( )	( )	( )

Imagine the type of community college teacher who strongly agrees with

TENURE

and then decide how this same teacher would also feel about the bottom concept in each pairing. Please indicate the extent of this teacher's agreement or disagreement by placing a cross in one of the boxes to the right.

	Strongly disagree			Neutral			Strongly agree
Tenure Merit Pay	( )	( )	( )	( )	( )	( )	( )
Tenure Academic Rank	( )	( )	( )	( )	( )	( )	( )
Tenure Academic Freedom	( )	( )	( )	( )	( )	( )	( )
Tenure Teacher Evaluation	( )	( )	( )	( )	( )	( )	( )
Tenure Collective Bargaining	( )	( )	( )	( )	( )	( )	( )

Imagine the type of community college teacher who strongly agrees with

MERIT PAY

and then decide how this same teacher would also feel about the bottom concept in each pairing. Please indicate the extent of this teacher's agreement or disagreement by placing a cross in one of the boxes to the right.

	Strongly disagree			Neutral			Strongly agree
Merit Pay Academic Freedom	( )	( )	( )	( )	( )	( )	( )
Merit Pay Teacher Evaluation	( )	( )	( )	( )	( )	( )	( )
Merit Pay Collective Bargaining	( )	( )	( )	( )	( )	( )	( )
Merit Pay Tenure	( )	( )	( )	( )	( )	( )	( )
Merit Pay Academic Rank	( )	( )	( )	( )	( )	( )	( )

Imagine the type of community college teacher who strongly agrees with

ACADEMIC RANK

and then decide how this same teacher would also feel about the bottom concept in each pairing. Please indicate the extent of this teacher's agreement or disagreement by placing a cross in one of the boxes to the right.

	Strongly disagree			Neutral			Strongly agree
Academic Rank Collective Bargaining	( )	( )	( )	( )	( )	( )	( )
Academic Rank Tenure	( )	( )	( )	( )	( )	( )	( )
Academic Rank Academic Freedom	( )	( )	( )	( )	( )	( )	( )
Academic Rank Merit Pay	( )	( )	( )	( )	( )	( )	( )
Academic Rank Teacher Evaluation	( )	( )	( )	( )	( )	( )	( )

Imagine the type of community college teacher who strongly agrees with

TEACHER EVALUATION

and then decide how this same teacher would also feel about the bottom concept in each pairing. Please indicate the extent of this teacher's agreement or disagreement by placing a cross in one of the boxes to the right.

	Strongly disagree			Neutral			Strongly agree
Teacher Evaluation	( )	( )	( )	( )	( )	( )	( )
Academic Rank							
Teacher Evaluation	( )	( )	( )	( )	( )	( )	( )
Merit Pay							
Teacher Evaluation	( )	( )	( )	( )	( )	( )	( )
Tenure							
Teacher Evaluation	( )	( )	( )	( )	( )	( )	( )
Collective Bargaining							
Teacher Evaluation	( )	( )	( )	( )	( )	( )	( )
Academic Freedom							

Please indicate the extent of <u>your</u> agreement or disagreement with each of the concepts listed below.

	Strongly disagree			Neutral			Strongly agree
Academic Freedom	( )	( )	( )	( )	( )	( )	( )
Academic Rank	( )	( )	( )	( )	( )	( )	( )
Collective Bargaining	( )	( )	( )	( )	( )	( )	( )
Merit Pay	( )	( )	( )	( )	( )	( )	( )
Teacher Evaluation	( )	( )	( )	( )	( )	( )	( )
Tenure	( )	( )	( )	( )	( )	( )	( )

THE UNIVERSITY OF NORTH CAROLINA
CHAPEL HILL, NORTH CAROLINA
27514

The L. L. Thurstone
Psychometric Laboratory

January 18, 1973

Richard D. Morris
13426 S.W. 61st Avenue
Portland, Oregon 97219

Dear Mr. Morris,

Enclosed you will find your request, a bibliography of work on multidimensional scaling (and related topics) performed at the L. L. Thurstone Psychometric Laboratory, and a brief description of available scaling programs. If you wish to receive any additional reprints or programs, please fill out the enclosed form and return it to:

Professor Forrest Young
Psychology Department
University of North Carolina
Chapel Hill, North Carolina 27514

Please allow 4-6 weeks for delivery. Note that there is a charge for processing the programs. Your check must accompany the request.

Sincerely,

Forrest W. Young
Associate Professor

FWY:mt