AN ABSTRACT OF THE THESIS OF

H. James Burton for the degree of Doctor of Philosophy in Education presented on December 6, 1983.

Title: A Survey of Research Tasks Required by Public School Administrators and Secondary and Elementary Teachers in Oregon

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Abstract approved:

E. Wayne Courtney

The purposes of this study were to determine which research tasks were necessary to the job descriptions of public school administrators, secondary and elementary teachers; what task clusters could be identified for college and university curriculums; what differences existed between sample groups.

The instrument was validated through the Delphi technique. The computed reliability coefficient was found to be +.974. The questionnaire contained 35 task statements, with a six-point scale being utilized to evaluate task importance with regard to job positions. The random sample consisted of 383 school administrators, elementary and secondary teachers. Tests of significance were conducted using a one-way analysis of variance, followed by Tukey's $\omega$ test for rejected hypotheses. R-mode factor analysis was used to cluster tasks.

Twenty-five of the thirty-five hypotheses were rejected. The total group identified 28 tasks as being somewhat important to very important, while seven were rated as having little importance to the job positions. Administrators scored the tasks consistently higher than did the teacher groups. A five-factor solution extracted 31 tasks with factor loadings of +.48 or higher, with two overlaps. Four spurious tasks were identified in the clustering phase of the analysis. The five factors which were generated for this study included:

Factor I - General Research Knowledge

Factor II - Tests and Instruments

Factor III - Use of Computers

Factor IV - Measures of Dispersion

Factor V - Data Collection and Reporting

Based on the findings of the study, curriculums should be developed around the five factors, giving proper attention to the differences noted between the three groups and to the magnitude of resulting task mean scores.

# A Survey of Research Tasks Required by Public School Administrators and Secondary and Elementary Teachers in Oregon

by

H. James Burton

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Typed by Debra K. Martin for H. James Burton

# DEDICATION

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To my wife, Linda, who provided me with the initial encouragement to continue my graduate studies, and then unselfishly gave her warm and enthusiastic support from beginning to end, I dedicate my love and this book. May that which she cherishes most, Love, Peace, and Wisdom be hers.

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

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I wish to enshrine my doctoral committee members, not only for the professional guidance they provided, but also for their encouragement when most needed, their selfless devotion to helping others, and because they are lovely people.

XXXXXXXXXXXXXXXXXXXXXXXXX

Dr. E. Wayne Courtney

Dr. Charlotte Lambert

Dr. Ken Naffziger

Dr. Mary Jane Wall

Dr. Carvel Wood

XXXXXXXXXXXXXXXXXXXXXXXXX

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Dr. Frank Cross and wife Marie, Dr. Carvel Wood, his wife Gloria and daughter Mary, together with my doctoral committee members made up the backbone of my support system while in Corvallis, and have become a valued part of my extended family.

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# A Survey of Research Tasks Required by Public School Administrators and Secondary and Elementary Teachers in Oregon

## I. INTRODUCTION TO THE STUDY

There have been few studies conducted in the last fifteen years which have identified specific skills and/or knowledge desirable for personnel involved in educational research, evaluation, and related activities. This would seem to suggest that there may be cause for concern in the curriculum(s) of those individuals in teacher training, and university instructional staff in the areas of planning and implementing research, reading professional journals and reports, and in application of the results provided by professionals, within and outside of one's own specific field of preparation.

In a paper presented at the annual meeting of the American Educational Research Association in Toronto, Canada (1978), Owenby and Thomas cited numerous studies that emphasized the serious damage that may result from educators being inadequately trained in evaluation and research skills. They quoted Larson and Valentine (1975) as asserting that poorly answered and unanswered questions limit the effectiveness and efficiency of vocational education at all levels. Popham (1974) was cited as indicating that conclusions based on faulty research or evaluation may seriously damage program participants as well as future generations.

Although Owenby and Thomas limited their study to vocational educators, some of their sources were much broader in their findings. Studies by Worthen _et al_ (1971) and Worthen (1976) suggested that the need for research and evaluation skills is great among all educators.

Studies such as those conducted by a team from the Alabama State Department of Education (1976) and Jozwiak _et al_ (1981) at the University of Tennessee have shown concern for adequate knowledge of research tasks in the field where the studies will be used.

Kaplan (1976) saw a great danger resulting from the lack of skills among educators when he suggested that, because classroom teachers have little competence in conducting formalized research, they hold no value for research as a part of classroom practice. He went on to emphasize that research can be made immediately relevant and that this can be accomplished through a cooperative effort between the university and the public schools.

These concerns seem adequate to suggest a need for the present study, one which regards research skills as they relate to the public educator.

## Statement of the Problem

The central goal of this study was to determine which research tasks were necessary to the job positions of public school administrators, secondary teachers and elementary teachers. The study addressed three major questions:

1. What specific research tasks are viewed as necessary for public school administrators, secondary teachers, and elementary teachers?
2. What clusters are relevant to college and university curriculums?
3. What differences exist between the sample groups?

## Definitions of Terms

The following definitions are provided for purposes of clarifying the terms used in this study; other terms or phrases used as a part of the dialogue are considered to be self-explanatory.

Cluster is a matrix of research tasks whose intercorrelations are high with factor loadings of ±.48 or higher. A cluster is referred to as a factor.

Delphi Technique is an expert opinion forecast method that interactively integrates the responses of surveyed experts. The method utilizes a series of three or four iterations with controlled feedback, using a questionnaire or similar device to reach consensus. The method was developed by the Rand Corporation to facilitate reaching agreement within large committees. The Delphi technique is based upon rational judgment and shared information, with the idea that experts can make conjectures about the future. The method has been used successfully in industry and for the identification of goals for education.

Common Factor is a statistical representation of some trait which two or more tasks in the questionnaire have in common.

Common Variance is the sharing of variance by two or more tasks. In such a sharing, the tasks are correlated and therefore have some traits in common.

Elementary Teachers are those personnel who are presently employed in Oregon's public schools and who possess a Masters or higher level degree from an accredited institution of higher learning.

Factor Analysis consists of a collection of procedures for analyzing the relations among a set of random variables observed, counted, or measured for each individual of a group. The purpose of factor analysis is to account for the intercorrelations among variables by postulating a set of common factors. It may be defined as a method for extracting common factor variances from sets of measures.

Factor Loading is the correlation of any particular research task with the other research tasks being extracted in the same factor. Factor loadings may range from -1.00 to +1.00.

Factor Solution refers to the number of factors the computer program was set to generate. The different factor solutions were studied in accordance to pre-set criteria in order to select the most appropriate number of factors for analysis.

R-Technique is a factor analytic method which examines the relationship of every research task with every other research task and provides for a clustering of common tasks. In the R-technique, items are intercorrelated and factored according to respondents.

Research Tasks are those elements of an individual's job which pertain to interpretation and application of research-oriented activities.

Secondary Teachers are those personnel who are presently employed in Oregon's public schools and who possess a Masters or higher level degree from an accredited institution of higher learning.

School Administrators are defined as those personnel who are presently employed as administrators in Oregon's public schools and possess a Masters or higher level degree from an accredited institution of higher learning, and who possess a valid Oregon administrative certificate.

Specific Factor is a statistical representation of abilities or traits whose factor loadings are ±.48 or higher.

Spurious Research Task is a research task with a factor loading of less than ±.48. It is identified as clustering with the factor in which its highest factor loading occurred, even though its loading is less than ±.48.

Tukey's ω Method is a multiple contrast procedure which is applicable to pairwise comparisons of means. It is appropriately used as a follow-up procedure in situations where null hypotheses have been rejected in analysis of variance testing.

## Background of the Study

Since the Vocational Education Act was enacted in 1963, there has been an increasing awareness of the need to incorporate research skills into vocational training programs for educators. Courtney and Halfin (1969) were pioneers in identifying professional training needs and requirements for teachers in the vocational-technical area.

In 1966, Moss identified skills deemed important by the educational researcher by having them list and rank those skills that they were currently using. He proposed a preparational program for educational researchers based on his study.

In the same year, the American Educational Research Association (AERA) recognized the need for improving the skills of educational researchers. AERA established a task force on educational research personnel training. The purpose of this group was to identify the training needs and to consider methods for satisfying these needs.

Worthen and Gagne (1969), Glass and Worthen (1970), and Anderson *et al* (1971) helped to identify skills essential for educators during their involvement with the AERA Task Force. Later, Worthen (1976) synthesized these efforts into a list of competencies needed in educational research and evaluation.

Encouraged by the AERA's concern with improving research skills, a team of educational researchers at Florida State University, headed by Andreyka (1976), designed a project to help develop a competency based approach to teacher education involving research skills and evaluation competencies. Bargar *et al* (1970) had previously designed a program at Ohio State University aimed at students from all fields who had had no previous training in educational research. Owenby and Thomas (1978) followed their lead and that of Courtney and Halfin (1969) and conducted a study designed to identify research and evaluation competencies needed by vocational educators.

Meanwhile, at Oregon State University, a proposal by the Division of Vocational Adult and Community College Education was to influence the studies of three doctoral candidates. The proposal stated, in part, that Oregon State University should take the lead in building a training program for beginning teachers that would deal with tasks with which they would actually be confronted in the field.[1] Gunderson (1971) conducted a study focusing on the identification of the common professional education competencies of community college instructors of trade and industrial education. Lindahl (1971) and Miller (1971) considered similar problems.

The importance of research in various disciplines has gained recognition in recent years. At the National Conference on Research in English held in Champaign, Illinois (1961), various proponents of research discussed its importance in the language arts field. Gelso (1974) studied the importance of research in counseling psychology and Aller (1980) presented a paper entitled "The Role of Research in Undergraduate Psychology Education" to the Midwestern Psychological Association. The Association of Administrators of Home Economics met at Michigan State University (1970) to formulate goals and guidelines for research in their field. Their primary objective was to strengthen the research base in home economics.

Foreign countries have taken a serious look at the need for research and its importance to the practitioneer. Kida (1981) reported that, in Japan, half of the university budget is allotted to research. Canada, in addition to hosting the American Educational Research Association in 1978, has produced studies, such as that by Holdaway (1980), which was partially concerned with the overall organization of research, staff research, graduate student research, and general difficulties encountered in the conduct of research.

Winner of the 1983 Nobel Prize in economics, Dr. Gerard Debreu,

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[1]This proposal was quoted by Gunderson (1971) to defend his study.

of the University of California at Berkeley, pointedly attacked what he called an alarmingly low level of funding for basic research at U.S. universities. "The funds for research should be at least doubled..."[2]

The background for the present study included a search of various literature that used similar methodological procedures. Many studies were found that are related and were included in the bibliography; the following studies are cited as being most relevant.

Under the leadership of McCormick (1954), Chalupsky (1954) and Finn (1954) used factor analysis to study office occupations and clerical jobs. These studies helped establish factor analysis as a worthwhile methodology for research in job inter-relationships.

Sjorgen (1967) conducted a study of common job behaviors by using factor analysis techniques to show inter-correlations between agricultural and metal-fabricating occupations.

Courtney (1967) developed an instrument for identifying and comparing the common professional needs and abilities required for teachers of vocational education. Courtney collected the data for his instrument by reviewing the literature and consulting a group of specialists from the vocational areas he was studying.

Courtney and Halfin (1969) used factor analysis to determine the training needs of high school vocational teachers. Responses from randomly selected vocational teachers representing four states were analyzed in order to determine their common needs for a training program.

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[2] Statesman-Journal, Salem, Or., Tuesday, October 18, 1983.

In a similar study, Halfin and Courtney (1970) used a Likert-type scale and factor analysis to poll 150 teachers randomly chosen from five areas of vocational education. At least six clusters were identified that could be used in curriculum development.

The study which most closely resembled the present study in methodology was conducted at Florida State University, where Andreyka et al (1976) focused on the criteria for assessing mastery of professional skills important to vocational educators involved in research and evaluation. Andreyka's team began with the list of competency statements drafted by the AERA Task Force under Worthen's leadership. A factor analysis of this list had already yielded several clusters of common research and evaluation tasks of competencies, so the list was simply revised to better fit the needs of the study and sent to a three-member jury for preliminary validation. Recommendations of the jury were synthesized and a final list of fifty-six competencies was compiled. This instrument was distributed to a random sample of 214 people representing vocational education teachers, teacher educators, administrators, and researcher. They were asked to respond to the questionnaire items using a Likert-type six-point scale. A one-way analysis of variance was used to determine whether significant differences existed in the mean importance ratings of competencies among the five groups. The Newman-Keuls' Test was utilized to identify the source of significant differences. It was determined that all competencies listed were important, but significant differences were observed among the means of the subgroups.

Stamps (1980) developed a basic list of competencies in consumer education and personal finance, then constructed a survey instrument to determine the acceptance of content and level of learning for emphasis in curriculum development. The survey instrument was mailed to a random sample of teachers in the subject matter areas of business education, home economics, mathematics, social studies, and members of the business community. They were asked to judge each competency based on their own experience. Factor analysis was used on the data to determine the underlying pattern of relationships by condensing a large number of competencies into a smaller set of factors for interpretation. The data were analyzed by mean score comparison and ranking, and a one-way analysis of variance was applied.

Behroozian (1981) utilized a similar design to identify competencies required by elementary/secondary teachers in the fields of ESL and bilingual education. He first reviewed the literature to prepare a needs statement questionnaire, which was presented to a Delphi panel for evaluation. The questionnaire was then mailed to randomly selected ESL and bilingual teachers asking them to judgmentally assign a value to each competency listed. The findings were the results of two-way analysis of variance, factor analysis, and Hoyt-Stunkard internal consistency analysis of the responses of the sample group.

Samahito (1984) used a similar design for the development of curricula to prepare physical education teachers and other physical educators in Thailand. An instrument was developed containing fifty-six physical education competencies in combination with two scales: a five point Likert scale which enabled the respondents judgmentally to score the importance of content and a six-point ordinal measure relating to the major heading of Bloom's cognitive taxonomy. The six-point cognitive scale allowed each respondent to score judgmentally the taxonomic level considered necessary for adequate experience and skills required of the graduate student in physical education in Thailand. Content validity for the instrument was established using the Delphi Technique. Analysis of data utilized one-way analysis of variance, Tukey's $\omega$ test, factor analysis, and Hoyt-Stunkard internal consistency analysis.

Dalkey and Helmer (1963) and Linstone and Turoff (1975) have described an expert opinion technique known as the Delphi method. This technique surveys experts independently and therefore combines some of the advantages of surveys and panels. Porter _et al_ (1980) describes Delphi as a popular technique in technological and social forecasting.

Dillman (1978), in his mail and telephone survey, looked at a method designed to maximize response from survey questionnaires. His study included reasons for nonresponse and suggested guidelines for a mail survey. He covered the basic appeal, writing the cover letter, making the respondent feel important, vital elements to be included in the questionnaire and the actual mailing and follow-up. He discussed scrutinizing the returns and planning ahead to help avoid extra work and expense.

In summary, various studies point out the need to incorporate research skills into educational training programs. They show the importance of updating curriculum to meet the needs of the practitioner as being of vital importance if educators are to be trained in skills necessary to do the best job in their field.

Methodological approaches focus on the Delphi technique, factor analysis, analysis of variance, and the Likert Scale as being commonly used by researchers in dealing with similar problems. These techniques appear to be the acceptable approach for identifying desirable tasks in a specified area. Mail surveys are an easy and effective way of reaching a large sample chosen at random from identified populations.

## Importance of the Study

Research has become a part of everyday life in the United States. It affects the consumer of goods as well as the professional researcher and affects progress in the country. It also affects millions of students from kindergarten through university levels.

Simpson (1963), speaking specifically to vocational and practical arts educators in her report to the American Vocational Association, referred to the results of expanding research and encouraged teachers to take an active part in research in their field. She urged them to become better acquainted with the techniques and methodologies of research and to conduct research. Simpson emphasized that research is the responsibility of each educator and that each should use research findings in his everyday work.

In his final report on a research seminar conceptualized as a special teaching project in developing research needs of instructional leaders, Elswick (1967) discussed the importance of educational research. He emphasized that all leadership personnel in education and in the training profession have a vested interest in research.

Gunderson (1971) based the importance of his study on the fact that most research pertaining to performance-based curriculum development had been descriptive in nature and had contributed little specific information about competencies needed in the field. Gunderson's work dealt with education competencies needed by instructors in the vocational field.

Hamreus (1969) and others saw the need to incorporate research training into college courses. Fifty-eight college professors attended the National Research Training Institute in Monmouth, Oregon, in an effort to increase their skills in such areas as task analysis, research design, data analysis and proposal and report writing. Hamreus noted in his report that "empirical development of courses of instruction required several specialized skills and utilized a newly evolving knowledge base."[3]

Bargar et al (1970) discussed the inadequate production of research and development personnel by schools of education. They cited evidence that research courses taken in education appear to be unrelated to the production of primary researchers. They suggested that a greater degree of integration of knowledge concerning educational contexts and methodological or technical solution strategies are needed.

In response to an article by Long (1981), which describes a high school setting where educational research is practiced, Armstrong (1982) stressed the importance of applied research at this level. In his article entitled "The Practitioner: The Missing Link in Educational Research," he stated that if even a substantial minority

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[3]Hamreus, p. 3.

of the educational practitioners were filling in the link with their research, it might transform the educational system. He quoted Corey (1953) as recognizing the need for administrators and teachers to be involved in research in order to be effective in their jobs.

These reports seem to focus on the necessity for continued study in the field of educational research. As early as 1953 the need for public school administrators and teachers to become involved in research was noted. As recently as 1982 the practitioner was still seen as the "missing link" in research. Some studies have been done in various disciplines, but regular studies with follow-up dictating curriculum change has been lacking. The present study is designed to correct this omission.

# II. THE METHOD OF THE STUDY

The method of the present research is prefaced in the procedures developed by Chalupsky (1954), McCormick (1954), Finn (1954), Courtney (1967), Courtney and Halfin (1969,1970), Stamps (1979), Behroozian (1981), Hammer (1983), and Samahito (1984). These studies utilized the principle of justifying that the worker was in the best position to judge the tasks necessary to his or her employment. The method which is detailed in this section of the report stems from an acceptance of this premise.

## The Dependent Variable

The dependent variable in this study was a score which was judgmentally assigned to the research tasks by randomly selected respondents. Respondents included school administrators, secondary teachers, and elementary teachers who were currently employed in Oregon public schools. Respondents were asked to indicate the level of importance of each research task based on their perceived needs in their jobs. The research tasks scores were based on a six-point Likert-type scale shown below. Each research task was considered independently.

1 - Very little importance

2 - Little importance

3 - Somewhat important

4 - Important

5 - Very important

6 - Extremely important

## Instrumentation

The instrument used in this study was a mailed survey form containing thirty-five research tasks. The instrument's format enabled the respondent to score judgmentally each task according to the perceived importance of the task to his or her job function. The development of the instrument was produced in conjunction with a companion study being completed concurrently at Oregon State University by Soukup (1984). Soukup used the same instrument in studying different populations.

Through a review of the literature, it was determined that several tasks and competencies had been considered as being important to research methodology. Moss (1966) identified skills important to the educational researcher. Worthen (1979) synthesized the work of the American Educational Research Association (AERA) Task Force, producing a list of competencies needed in educational research and evaluation, and Andreyka *et al* (1976) compiled a similar list of research tasks and skills important for educators. Studies by Halfin and Courtney (1970), Lindahl (1971), Miller (1971), Stamps (1979), Behroozian (1981), Samahito (1984) and Andreyka *et al* (1976) provided the base for using the Likert scale.

Items from the lists of these earlier studies were carefully considered to determine their appropriateness for the present study. The list was presented to a Delphi Panel, consisting of eighteen members, for the purpose of evaluation and addition of research tasks.

The Delphi technique was described by Dalkey and Helmer (1963) and Linstone and Turoff (1975) as a method for surveying experts in the field of study independently, combining advantages of surveys and panels. Linstone and Turoff (1975) cited five to ten members of a Delphi panel as being adequate in numbers. Following this logic, eighteen members were considered appropriate for the present study. Delphi members were chosen from each of the populations selected in the Soukup (1984) study, and from the populations of the present study (A list of Delphi members appears in Appendix A). These areas included the Oregon State Department of Education, university teachers, public school administrators, secondary teachers, and elementary teachers. The original list contained sixty-nine research tasks and, after three iterations by the Delphi Panel, the list was synthesized into thirty-five tasks. A copy of the instrument and the cover letter appear in Appendices B and C.

Field testing was conducted using twenty-eight representatives from the study's populations. The purpose of the field-testing was to validate clarity of the instructions, format, and language usage within the survey form.

## The Reliability of the Instrument

An estimate of the internal consistency reliability of the scores assigned by respondents to the research tasks was determined using the method described by Hoyt and Stunkard (1952). This method, using the analysis of variance, provided a straight-forward solution to the problem of estimating the reliability coefficient for unrestricted scoring items. For this test, thirty-five research tasks were included in the instrument. Therefore, there was one matrix, with 383 respondents, thirty-five research tasks, and one response per cell.

Schematically, the matrix is as follows:

| | Respondents | | | | | |
|---|---|---|---|---|---|---|
| Research Tasks | 1 | 2 | 3 | j | 383 | Total |
| 1 | $y_{11}$ | $y_{12}$ | $y_{13}$ | $y_{1j}$ | $y_1{}^{383}$ | $y_1 \cdot$ |
| 2 | $y_{21}$ | $y_{22}$ | $y_{23}$ | $y_{2j}$ | $y_2{}^{383}$ | $y_2 \cdot$ |
| 3 | $y_{31}$ | $y_{32}$ | $y_{33}$ | $y_{3j}$ | $y_3{}^{383}$ | $y_3 \cdot$ |
| . | | | | | | |
| . | | | | | | |
| . | | | | | | |
| i | $y_{i1}$ | $y_{i2}$ | $y_{i3}$ | $y_{ij}$ | $y_i{}^{383}$ | $y_i \cdot$ |
| . | | | | | | |
| . | | | | | | |
| . | | | | | | |
| k | $y_{k1}$ | $y_{k2}$ | $y_{k3}$ | $y_{kj}$ | $y_k{}^{383}$ | $y_k \cdot$ |
| Total | $y_{.1}$ | $y_{.2}$ | $y_{.3}$ | $y_{.j}$ | $y_{.}{}^{383}$ | $y_{..} \cdot$ |

Each $y_{ij}$ represents the score judgmentally assigned the $j^{th}$

respondent to the $i^{th}$ component. The total sum of squares is given by:

$$\sum_{i=1}^{k} \sum_{j=1}^{383} y_{ij}^{2} = \frac{\left(\sum_{i=1}^{k} \sum_{j=1}^{383} y_{ij}\right)^{2}}{383k}$$

The sum of squares for components was obtained by:

$$\frac{\sum_{j=1}^{383} (y_{.j})^{2}}{k} - \frac{(y_{..})^{2}}{383k}$$

The residual sum of squares was obtained by subtraction. The estimate of reliability was obtained by:

$$\frac{\text{Mean Square Respondents} - \text{Mean Square Residual}}{\text{Mean Square Respondents}}$$

Reliability Layout (ANOVA):

| Source of Variation | df | SS | MS | r |
|---|---|---|---|---|
| Tasks | 34 | A | A/34 | |
| Respondents | 380 | B | B/380 | $\frac{(B/380) - (C/12920)}{(B/380)}$ |
| Residual | 12920 | C | C/12920 | |
| Total | 13334 | | | |

## Experimental Design

The experimental design which was followed for the data analysis paralleled previous procedures utilized for dissertation studies which have identified tasks for workers. (Courtney, 1962; Soukup, 1984; Samahito, 1984)

The mathematical model which is appropriate to the testing of hypotheses for the one-way design is illustrated as follows:

$$y_{ij} = \mu + \alpha_i + \varepsilon_{ij}$$

Where, $\mu$ is the true mean score of workers in three selected occupational groups.

$\alpha_i$ is a differential fixed effect associated with group.

$\varepsilon_{ij}$ is a random variable, which is characterized as being normally and independently distributed with a mean of zero and a variance of $\sigma^2$.

The sample was randomly drawn from lists of the total populations representing Oregon's school administrators, secondary teachers, and elementary teachers, who were certified, currently employed, and who possessed a Master's or higher degree. The sample selection was completed by Oregon's State Department of Education.

The sampling pattern is illustrated in the following matrix.

SAMPLE MATRIX

| GROUPS | | |
| --- | --- | --- |
| A | B | C |
| N=118 | N=138 | N=127 |

Where: A = School Administrators

B = Elementary teachers

C = Secondary teachers

The smallest cell size of 118 exceeds the power level of .90 when the effect size is equal to .20 and the alpha level is set at .05. A power level of .80 is consistent with the practice of allowing that Type I errors are four times more serious than Type II errors and that larger sample sizes are necessary in providing higher power levels. The larger sample size per cell increases the power of the test of the hypotheses. (Cohen, 1969)

These criteria were judged to be more than adequate to provide data for hypothesis testing.

A one-way analysis of variance test was utilized to test the following hypothesis for each of the thirty-five research task statements.

$$\mu_1 = \mu_2 = \mu_3$$

Where, $\mu_1$ is the mean score for Oregon school administrators.

$\mu_2$ is the mean score for elementary teachers from Oregon.

$\mu_3$ is the mean score for secondary teachers from Oregon.

The one-way analysis of variance design for the study is illustrated in the fixed arrangement shown below.

TABLE I

Analysis of Variance Layout

| Source of Variation | df | SS | MS | F |
|---|---|---|---|---|
| Between (groups) | 2 | A | A/2 | $MS_{Bet}/MS_{error}$ |
| Error | 380 | B | B/380 | |
| Total | 382 | C | | |

The .05 level of significance was selected as the basis for retention or rejection of the null hypothesis. Tukey's ω test[4] was utilized as the multiple comparison vehicle for indicating pairwise comparisons in the testing of hypotheses.

Factor analysis was used to ascertain the groupings of tasks for purposes of planning curriculums. Clusters of research tasks were identified utilizing the R-mode. Research tasks with rotated factor loadings of .48 were considered as being clustered within a factor.

The model for factor analysis is keyed to the three kinds of variances which are present for all data. The model consists of the following: (Courtney, 1983)

$$V_t = V_{co} + V_{sp} + V_e$$

[4]Ferguson, (1981); Steel and Torrie (1980)

Where, $V_t$ is the total variance.

$V_{co}$ is the variance that two (2) or more measures share in common.

$V_{sp}$ is the variance which is specific to each individual measure.

$V_e$ is the variance attributed to error.

The factor analysis was programmed to cluster orthogonally tasks according to a generated R-mode intercorrelation matrix. Tasks were clustered to account for the largest percentage of common variance.

## Collection of the Data

The School of Education, Oregon State University, provided assistance to the study in the form of supplying envelopes, providing for bulk mailing rates, and endorsing the study. This consideration was given because of the implications the findings could have in updating curriculum in research classes being taught at Oregon State University.

The instrument, shown in Appendix B, together with the cover letter, shown in Appendix C, and a return envelope were mailed to the sample groups. Instructions for completing the questionnaire were included in the format of the instrument. The cover letter explained the purpose of the request, the intended use of the data being collected, and the importance of the respondent's participation. Respondents were assured that responses would be held in confidence.

The instruments were number coded, assigned by sample groups, to facilitate follow-up procedures.

In an effort to increase return rates, return envelopes were stamped and addressed. Respondents were offered a copy of the findings of the study upon request.

A follow-up letter was mailed as a reminder to those who had not responded after three weeks. A copy of the follow-up letter appears in Appendix D. Duplicate instruments were mailed to those who requested them.

The data were entered into the CDC Cyber 170/720 computer for analysis by first recording the data on a 5 1/4" diskette, using an IBM Personal computer, and then transferring the data from the diskette to the CDC Cyber 170/720 computer via a modem.

During the transfer of data from the questionnaire to the diskette, a visual check of the screen verified the accuracy of the data input. After transfer of the data to the main computer terminal, a printout was compared to the questionnaires' original responses for final verification of accuracy.

# III. RESULTS AND DISCUSSION

The findings were the results of procedures which utilized the analysis of variance, Tukey's ω test, and factor analysis of the responses of 383 public school administrators, elementary, and secondary teachers from Oregon.

## Reliability of the Instrument

An estimate of the internal consistency reliability of the scores assigned by respondents to the research tasks was determined using the method described by Hoyt and Stunkard (1952). This analysis of variance methodology provided a straight-forward assessment of the internal consistency reliability of the instrument, which utilized a 6-point Likert-type scale.

The computed reliability coefficient for the instrument, shown in Table 2, was determined to be +.974. This internal reliability measure indicated that the respondents were consistent throughout the scoring of the 35 research tasks included in the questionnaire. Coefficients of this magnitude reflect a very high value for reliability (Sharp, 1979).

TABLE 2

The Reliability Coefficient for the Instrument

| Source of Variation | Degrees of Freedom | Mean Square | r |
|---|---|---|---|
| Tasks | 34 | 62.568 | |
| Respondents | 313 | 44.205 | +0.974 |
| Residual | 10642 | 1.138 | |
| Total | 10989 | | |

## Results of the Hypothesis Testing

The scope of the study included the assignment of respondent judgments to each of thirty-five research tasks. In all, a total of 383 randomly selected personnel provided scaled data for the analysis, with mean scores being based upon their judgments to each of the tasks on a 6-point equal-appearing interval scale. The mean values for the total respondent group ranged from a high value of 4.185 (Task 5 - Draw appropriate implications or generalizations from data analysis) to a low value of 2.573 (Task 29 - Identify properties of nominal, ordinal, and interval measurement scales). The pattern of ranges is indicated below.

| MEAN RANGE | FREQUENCY |
|---|---|
| >4.000 | 4 |
| 3.500-3.999 | 9 |
| 3.000-3.499 | 15 |
| 2.500-2.999 | 7 |
| <2.500 | 0 |

Thus, nearly one-half of the thirty-five task means fell in the range 3.000 - 3.499, with seven being tallied below that level. Only four means were found to be greater than 4.000, those being for the following tasks:

| Task | Description | $\bar{X}$... |
|---|---|---|
| 5 | Draw appropriate implications or generalizations from data analysis | 4.185 |
| 4 | Select appropriate standardized tests or instruments | 4.166 |
| 20 | Understand the capabilities of computer systems | 4.079 |
| 23 | Translate data analysis into recommendations | 4.021 |

When standard deviations were computed for total respondent data, the ranges extended from a low of 1.421 (Task 33 - Utilize methods of presenting data, charts, graphs, tables) to a high of 1.713 (Task 10 - Write and submit proposals to obtain funding) on the 6-point scale. These results suggest that a rather stable variation, as measured by the standard deviations of the scores, existed across the task responses. Standard errors for overall data showed an equally stable condition with ranges between .072 and .089.

The hypothesis testing was accorded on the basis of the question of differences between the means for three groups; namely, group A (administrators), group B (elementary teachers), and group C (secondary teachers). The range of mean scores for these groups are reported below:

| Group | Mean Range | Frequency | Tasks |
|---|---|---|---|
| 1 | >4.000 | 11 | 1,4,5,12,13,20,22,23, 24,33,35 |
| | 3.500-3.999 | 10 | 2,6,10,11,16,18,21,26, 27,34 |
| | 3.000-3.499 | 13 | 3,7,8,9,14,15,17,19,25, 28,30,31,32 |
| | 2.500-2.999 | 1 | 29 |
| | <2.500 | 0 | |
| 2 | >4.000 | 3 | 4,5,20 |
| | 3.500-3.999 | 9 | 1,12,13,23,24,26,33,34, 35 |
| | 3.000-3.499 | 10 | 2,6,9,10,15,16,17,18, 22,25 |
| | 2.500-2.999 | 13 | 3,7,8,11,14,19,21,27, 28,29,30,31,32 |
| | <2.500 | 0 | |
| 3 | >4.000 | 0 | |
| | 3.500-3.999 | 6 | 4,5,20,23,24,33 |
| | 3.000-3.499 | 17 | 1,2,6,9,10,12,13,15,16, 17,18,22,25,26,27,34,35 |
| | 2.500-2.999 | 10 | 7,8,11,14,19,21,28,30, 31,32 |
| | <2.500 | 2 | 3,29 |

These results indicate that Group A respondents scored tasks at a higher scale value than did the other two groups. Group A respondents, with eleven of the thirty-five means above 4.000, had noteably higher frequencies than Group B with three and Group C with none. Complementing this summation was the incidence of means classified for ranges below 2.999, with Group A having only one, while Groups B and C showed thirteen and twelve respectively.

The range of individual means for Group A was from a high value of 4.487 (Task 5 - Draw appropriate implications or generalizations from data analysis) to a low value of 2.788 (Task 29 - Identify properties of nominal, ordinal, and interval measurement scales). Task 29 was the only research component which was scored with a mean below 3.000 for Group A respondents. Standard deviations for Group A extended from a low of 1.205 (Task 24 - Collect data in a systematic manner) to a high of 1.597 (Task 18 - State the purpose and rationale for a research project). Group A standard errors showed a similar stability with a range of .112 to .149.

Group B means ranged from a high of 4.455 (Task 4 - Select appropriate standardized tests or instruments) to a low of 2.583 (Task 29 - Identify properties of nominal, ordinal, and interval measurement scales). Standard deviations for Group B responses followed a pattern similar to those for Group A, extending from 1.369 to 1.805.

Group C was characterized as having generated the lowest mean scores of any of the three groups included in the study. The highest average compiled by any task for Group C was for Task 20 - Understand the capabilities of computer systems, which had a mean of 3.841; the lowest mean was for Task 29 - Identify properties of nominal, ordinal, and interval measurement scales, which carried a mean value of 2.366. Group C standard deviations ranged from a low of 1.369 to a high of 1.733; standard errors ranged from .122 to .155.

Task 29 (Identify properties of nominal, ordinal, and interval measurement scales) was shown to be the lowest valued component in the study, scoring means of 2.788, 2.583, and 2.366 for Groups A, B, and C respectively. The highest means were for Task 5 ($X_A$ = 4.487), Task 4 ($X_B$ = 4.455), and Task 20 ($X_C$ = 3.841). These results are reported in

Table 3.

The study utilized analysis of variance to ascertain differences for the hypothesis

$$\mu_1 = \mu_2 = \mu_3$$

The results of the thirty-five F-tests which were made for the testing of hypotheses are presented in Table 3. The rejection level for the study was set at $\alpha = .05$. The pattern of the testing resulted in twenty-five rejections for the thirty-five hypotheses which were of interest to the research. Hypotheses for ten task statements were retained.

TABLE 3
Data Analysis

| Task Number | Factor Number | $\overline{X}$... | $S\overline{x}$... | Mean Ranking | S... | $\overline{X}_A$ | $\overline{X}_B$ | $\overline{X}_C$ | F | P | $H_o$ Decision | Pairwise Comparisons 1-2 | 1-3 | 2-3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | II | 3.752 | .081 | 9 | 1.584 | 4.155 | 3.766 | 3.365 | 7.790 | .001 | Reject | No | Yes | No |
| 2 | II | 3.452 | .083 | 14 | 1.610 | 3.728 | 3.358 | 3.307 | 2.443 | .088 | Retain | | | |
| 3 | I | 2.725 | .072 | 34 | 1.404 | 3.086 | 2.701 | 2.416 | 7.1087 | .001 | Reject | No | Yes | No |
| 4 | II | 4.166 | .079 | 2 | 1.525 | 4.243 | 4.455 | 3.784 | 6.675 | .001 | Reject | No | Yes | Yes |
| 5 | II | 4.185 | .076 | 1 | 1.467 | 4.487 | 4.267 | 3.815 | 6.809 | .001 | Reject | No | Yes | Yes |
| 6 | I | 3.432 | .075 | 15 | 1.466 | 3.684 | 3.259 | 3.384 | 2.753 | .065 | Retain | | | |
| 7 | I | 3.013 | .081 | 28 | 1.558 | 3.254 | 2.846 | 2.976 | 2.204 | .112 | Retain | | | |
| 8 | I | 3.022 | .079 | 27 | 1.538 | 3.363 | 2.859 | 2.887 | 4.073 | .017 | Reject | Yes | Yes | No |
| 9 | I | 3.333 | .080 | 17 | 1.556 | 3.491 | 3.311 | 3.211 | .987 | .377 | Retain | | | |
| 10 | I | 3.340 | .089 | 16 | 1.713 | 3.814 | 3.075 | 3.194 | 5.586 | .002 | Reject | Yes | Yes | No |
| 11 | I | 3.098 | .083 | 25 | 1.611 | 3.526 | 2.860 | 2.960 | 6.195 | .002 | Reject | Yes | Yes | No |
| 12 | II | 3.753 | .078 | 8 | 1.518 | 4.086 | 3.912 | 3.266 | 10.416 | .000 | Reject | No | Yes | Yes |
| 13 | III | 3.648 | .080 | 11 | 1.558 | 4.000 | 3.622 | 3.352 | 5.332 | .005 | Reject | No | Yes | No |
| 14 | I | 2.864 | .074 | 32 | 1.439 | 3.263 | 2.765 | 2.611 | 6.867 | .001 | Reject | Yes | Yes | No |
| 15 | I | 3.206 | .082 | 21 | 1.577 | 3.465 | 3.044 | 3.144 | 2.360 | .096 | Retain | | | |
| 16 | I | 3.287 | .082 | 19 | 1.597 | 3.600 | 3.243 | 3.048 | 3.730 | .025 | Reject | No | Yes | No |
| 17 | I | 3.162 | .080 | 23 | 1.545 | 3.330 | 3.074 | 3.103 | .998 | .370 | Reject Retain | Yes | No | No |

TABLE 3
Data Analysis Continued

| Task Number | Factor Number | $\overline{X}$... | $S\overline{x}$... | Mean Ranking | S... | $\overline{X}_A$ | $\overline{X}_B$ | $\overline{X}_C$ | F | P | $H_o$ Decision | Pairwise Comparisons 1-2 | 1-3 | 2-3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 18 | I | 3.299 | .088 | 18 | 1.695 | 3.687 | 3.082 | 3.176 | 4.537 | .011 | Reject | Yes | No | No |
| 19 | I | 2.923 | .082 | 30 | 1.586 | 3.226 | 2.824 | 2.750 | 3.141 | .044 | Reject | No | No | No |
| 20 | III | 4.079 | .075 | 3 | 1.460 | 4.427 | 4.000 | 3.841 | 5.321 | .005 | Reject | No | Yes | No |
| 21 | I | 3.040 | .081 | 26 | 1.568 | 3.609 | 2.793 | 2.781 | 11.551 | .000 | Reject | Yes | Yes | No |
| 22 | I | 3.671 | .085 | 10 | 1.653 | 4.164 | 3.434 | 3.472 | 7.729 | .001 | Reject | Yes | Yes | No |
| 23 | V | 4.021 | .082 | 4 | 1.580 | 4.474 | 3.815 | 3.823 | 7.122 | .001 | Reject | Yes | Yes | No |
| 24 | V | 3.995 | .076 | 5 | 1.477 | 4.287 | 3.985 | 3.736 | 4.244 | .015 | Reject | No | Yes | No |
| 25 | I | 3.231 | .083 | 20 | 1.610 | 3.448 | 3.096 | 3.176 | 1.606 | .202 | Retain | | | |
| 26 | IV | 3.541 | .076 | 13 | 1.478 | 3.693 | 3.743 | 3.184 | 5.651 | .004 | Reject | No | Yes | Yes |
| 27 | I | 3.166 | .084 | 20 | 1.619 | 3.509 | 2.956 | 3.081 | 3.933 | .020 | Reject | Yes | No | No |
| 28 | I | 2.910 | .076 | 31 | 1.474 | 3.123 | 2.779 | 2.857 | 1.810 | .165 | Retain | | | |
| 29 | I | 2.573 | .074 | 35 | 1.416 | 2.788 | 2.583 | 2.366 | 2.640 | .073 | Retain | | | |
| 30 | I | 2.836 | .080 | 33 | 1.538 | 3.148 | 2.724 | 2.664 | 3.532 | .030 | Reject | No | Yes | No |
| 31 | I | 2.957 | .080 | 29 | 1.534 | 3.230 | 2.793 | 2.888 | 2.717 | .067 | Retain | | | |
| 32 | I | 3.127 | .084 | 24 | 1.624 | 3.482 | 2.963 | 2.984 | 3.907 | .021 | Reject | Yes | Yes | No |
| 33 | V | 3.933 | .073 | 6 | 1.421 | 4.216 | 3.919 | 3.683 | 4.277 | .015 | Reject | No | Yes | No |
| 34 | IV | 3.584 | .075 | 12 | 1.449 | 3.858 | 3.588 | 3.333 | 3.975 | .020 | Reject | No | Yes | No |
| 35 | III | 3.756 | .084 | 7 | 1.639 | 4.246 | 3.715 | 3.357 | 9.253 | .000 | Reject | Yes | Yes | No |

## Results of Multiple Comparisons Testing

The F statistic is appropriately used to determine if difference(s) exist for situations involving the analysis of three means. Its result is to ascertain the probability of the existence of differences among the means being studied, but it cannot determine specific pairwise differences between means. Consequently, when significant differences are determined to be present for three or more means, a multiple comparisons follow-up analysis is required. The Tukey's $\omega$ method was utilized as the multiple comparisons' vehicle for the present study.

Federer (1955) points out that where the three means are involved, nineteen comparisons are possible. These include:

(1) $\mu_1 = \mu_2 = \mu_3$

(2) $\mu_1 <$ ($\mu_2$ is not appreciably different from $\mu_3$)

(3) $\mu_2 <$ ($\mu_1$ is not appreciably different from $\mu_3$)

(4) $\mu_3 <$ ($\mu_1$ is not appreciably different from $\mu_2$)

(5) ($\mu_1$ is not appreciably different from $\mu_2$) $< \mu_3$

(6) ($\mu_1$ is not appreciably different from $\mu_3$) $< \mu_2$

(7) ($\mu_2$ is not appreciably different from $\mu_3$) $< \mu_1$

(8) $\mu_1 < \mu_2 < \mu_3$

(9) $\mu_1 < \mu_3 < \mu_2$

(10) $\mu_2 < \mu_1 < \mu_3$

(11) $\mu_2 < \mu_3 < \mu_1$

(12) $\mu_3 < \mu_1 < \mu_2$

(13) $\mu_3 < \mu_2 < \mu_1$

(14) $\mu_1 < \mu_2$ but $\mu_3$ cannot be ranked relative to $\mu_1$ or $\mu_2$

(15) $\mu_2 < \mu_1$ but $\mu_3$ cannot be ranked relative to $\mu_1$ or $\mu_2$

(16) $\mu_1 < \mu_3$ but $\mu_2$ cannot be ranked relative to $\mu_1$ or $\mu_3$

(17) $\mu_3 < \mu_1$ but $\mu_2$ cannot be ranked relative to $\mu_1$ or $\mu_3$

(18) $\mu_2 < \mu_3$ but $\mu_1$ cannot be ranked relative to $\mu_2$ or $\mu_3$

(19) $\mu_3 < \mu_2$ but $\mu_1$ cannot be ranked relative to $\mu_2$ or $\mu_3$

Tukey's $\omega$ method allows for the contrasting of each mean with every other mean in its analysis. Hence, the following pairwise contrasts were made available to the research as this technique was utilized.

$K_1 - K_2$ $K_1 - K_3$

$K_2 - K_3$

The results of the followup testing verified the location(s) of significant differences for each of the rejected hypotheses except for one task (Task 19 - where $X_A = 3.226$, $X_B = 2.824$, and $X_C = 2.750$). The F statistic rejected the Task 19 hypothesis; however, the Tukey's method did not detect the location of the differences. Positions of differences for the other 24 rejected statement means were determined through the pairwise comparison method.[5] All multiple comparison tests were made at the .05 level of significance with the results of the testing showing the following composite outcomes.

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[5]It should be noted that the Tukey's $\omega$ method is one which protects against increases in levels of rejection while maintaining a high power level; hence, Tukey's $\omega$ and the F statistic may have been made at slightly different levels for rejection of the hypothesis.

| Comparisons | Frequency |
|---|---|
| $\mu_1 = \mu_2$ | 24 |
| $\mu_1 = \mu_3$ | 13 |
| $\mu_2 = \mu_3$ | 31 |
| $\mu_1 > \mu_3$ | 23 |
| $\mu_1 > \mu_2$ | 11 |
| $\mu_2 > \mu_3$ | 4 |

Although eleven of the thirty-five hypotheses showed that means were equal in the F tests, twenty-three tests indicated that Group A means were significantly higher than those for Group C. Likewise, eleven Group A means were determined to be significantly larger than for those in Group B when Tukey's $\omega$ was applied to the data. Groups B and C means were different for four tasks. These results are shown in in Table 3.

## Results of Factor Analysis

Factor analysis was utilized to establish the clustering structure for the thirty-five research task statements. The R-mode process, which clustered tasks according to respondent ratings, examined the data for purposes of curricula planning.

A total of five factors were generated through the R-mode process when the criterion of minimum factor loading was set at +.48. This criterion verified and accounted for a total of 31 of the 35 task statements with the clustering of at least one task per cluster (factor) and where only two overlapping loadings were present. Task 2 loaded on both Factor I and Factor II; Task 22 was determined to be loaded on Factors I and V.

Factor I - General Research Knowledge

The first factor generated 21 task statements with factor loading equal to or exceeding +.48. Two spurious tasks (10 - Write and submit proposals to obtain funding and 17 - Locate publication outlets for research reports, articles, or books) were shown to be assigned to the General Research Knowledge factor. Factor I accounted for 82.0 percent of the common variance in the factoring. Task statements, means, and factor loadings are shown in Table 4.

TABLE 4

Factor I - General Research Knowledge

| Task Number | Task Statement | $\bar{X}$... | Vco |
|---|---|---|---|
| 2 | Identify factors which jeopardize internal and external validity | 3.452 | .539 |
| 3 | Obtain informatin through Dissertation Abstracts, indices, and data-based computer retrieval systems | 2.724 | .499 |
| 6 | Evaluate research reports | 3.432 | .576 |
| 7 | Identify the sample for a research study | 3.013 | .747 |
| 8 | Determine the type of research (descriptive, historical, experimental) that should be utilized | 3.021 | .702 |
| 9. | Define general principles of instrument construction, including reliability and validity | 3.333 | .660 |
| 11 | State appropriate assumptions and definitions for a research study | 3.098 | .765 |
| 14 | Apply sampling theory and techniques, including variations of simple random sampling | 2.864 | .709 |
| 15 | Specify data necessary for testing an hypothesis | 3.206 | .757 |

| | | | |
|---|---|---|---|
| 16 | Understand the effect of measurement error on the precision of an experiment | 3.287 | .681 |
| 18 | State the purpose and rationale for a research project | 3.299 | .718 |
| 19 | Apply techniques for increasing precision in research designs | 2.923 | .768 |
| 21 | Assess feasibility constraints (time, access to subjects, control, money) which are associated in conducting a study | 3.040 | .642 |
| 22 | Report research findings and implications | 3.671 | .582 |
| 25 | State the hypotheses in a research study | 3.231 | .697 |
| 27 | Organize the research process (hypothesis, evidence, inferences) | 3.166 | .689 |
| 28 | Use randomization and sample selection as a means of experimental control | 2.910 | .748 |
| 29 | Identify properties of nominal, ordinal, and interval measurement scales. | 2.573 | .698 |
| 30 | Establish confidence levels in the testing of hypotheses | 2.836 | .749 |
| 31 | Specify appropriate independent and dependent variables for a study | 2.957 | .768 |
| 32 | Apply appropriate statistical techniques for the analysis of a particular set of data | 3.127 | .690 |
| | Spurious Tasks | | |
| 10 | Write and submit proposals to obtain funding | 3.340 | .367 |
| 17 | Locate publication outlets for research reports, articles, or books | 3.162 | .430 |

The composition of the makeup of tasks included in Factor I included means which ranged from 2.573 (Task 29 - Identify properties of nominal, ordinal, and interval measurement scales) to 3.671 (Task 22 - Report research findings and implications). Within the factor, seven of the task means were below 3.000, with all of the others, except for Task 22, falling at a level below 3.500. The cluster, as a composite, possessed means which were low throughout.

Factor II - Tests and Instruments

The clustering pattern for Factor II generated four task statements when the +.48 loading criteria was applied. An additional task (12 - Construct and use rating scales, checklists, questionnaires, interview schedules, and observation systems) loaded spuriously on the factor with a loading of +.436. Means and factor loadings are reported in Table 5.

TABLE 5

Factor II - Tests and Instruments

| Task Number | Task Statement | $\overline{X}$... | Vco |
|---|---|---|---|
| 1 | Conduct necessary "non-instrument" data collection techniques, such as observation and interviews. | 3.752 | .672 |
| 2 | Identify factors which jeopardize internal and external validity. | 3.452 | .544 |
| 4 | Select appropriate standardized tests or instruments. | 4.166 | .492 |
| 5 | Draw appropriate implications or generalizations from data analysis. | 4.185 | .703 |
| | <u>Spurious Tasks</u> | | |
| 12 | Construct and use rating scales, checklists, questionnaires, interview schedules, and observation systems. | 3.753 | .436 |

Factor II accounted for 7.3 percent of the common factor variance in the analysis. Factor II data are shown in Table 5.

The means for tasks included in this factor ranged from a high of 4.185 (Task 5 - Draw appropriate implications or generalizations from data analysis) to a low of 3.452 (Task 2 - Identify factors which jeopardize internal and external validity). Task 4 (Select appropriate standardized tests or instruments) which loaded on Factor II, carried a mean of 4.166. The means for Factor II tended to be large throughout compared with the other clusters.

Factor III - Use of Computers

The third cluster generated three task statements with no spurious elements. The purity of this factor is reflected in both the content and in the very high factor loadings, each of which was +.659 or higher. Means and factor loadings are shown in Table 6.

TABLE 6

Factor III - Use of Computers

| Task Number | Task Statement | $\bar{X}$... | Vco |
|---|---|---|---|
| 13 | Interpret computer output | 3.648 | .659 |
| 20 | Understand the capabilities of computer systems | 4.078 | .706 |
| 35 | Use computer equipment for data analysis | 3.756 | .714 |

Factor III accounted for 4.7 percent of the common factor variance, as shown in Table 9.

Factor IV - Measures of Dispersion

Factor IV included two task statements which met the criterion of loadings above +.48. Both of the tasks [26 - Understand measures of dispersion (percentiles, range, standard deviation)] and [34 - Understand measures of central tendency (mean, median, model)] generated means above 3.500. The fourth cluster accounted for 3.5 percent of the common factor variance. This variance accountability is reported in Table 9.

TABLE 7

Factor IV - Measures of Dispersion

| Task Number | Task Statement | $\bar{X}$... | Vco |
|---|---|---|---|
| 26 | Understand measures of dispersion (percentiles, range, standard deviation) | 3.541 | .592 |
| 34 | Understand measures of central tendency (mean, median, mode) | 3.584 | .652 |

Factor V - Data Collection and Reporting

The fifth cluster accounted for 2.5 percent of the common variance (Table 8) and included three tasks which loaded above +.48. One spurious task [33 - Utilize methods of presenting data (charts, graphs, tables)], with a loading of .418, was listed as belonging to Factor V. Means and factor loadings are shown in Table 8.

TABLE 8

Factor V - Data Collection and Reporting

| Task Number | Task Statement | $\bar{X}$... | Vco |
|---|---|---|---|
| 22 | Report research findings and implications | 3.671 | .530 |
| 23 | Translate data analysis into recommendations | 4.021 | .539 |
| 24 | Collect data in a systematic manner | 3.995 | .481 |
| | Spurious Tasks | | |
| 33 | Utilize methods of presenting data (charts, graphs, tables) | 3.933 | .418 |

Common Factor Variance

Common variance is the sharing of variance by two or more tasks. In such a sharing, the tasks are correlated and therefore have some traits in common. Thus, all tasks which cluster within a factor share some trait in common.

The cumulative percentage of the common variance accounted for in the analysis totalled 100 percent with five factor solutions. Table 9 presents the cumulative percentage breakdown.

TABLE 9

Cumulative Percentage of Common Variance

| Factor Solution | Percentage | Cumulative Percentage |
|---|---|---|
| 1 | 82.0 | 82.0 |
| 2 | 7.3 | 89.3 |
| 3 | 4.7 | 94.0 |
| 4 | 3.5 | 97.5 |
| 5 | 2.5 | 100.0 |

Factor I accounted for the majority of the common variance, 82.0 percent, encompassing 23 tasks. A sharp decrease is shown between Factor I and II, with Factor II accounting for 7.3 percent, and containing five tasks. Less common variance is accounted for, as each factor solution is added, with Factors III, IV, and V accounting for 4.7, 3.5, and 2.5, respectively. This pattern of the common variance logically structured itself according to the factor analysis model, which supports the contention that the first generated factor should account for the largest percentage of common variance. The model's premise calls for each subsequent factor to generate less and less common factor variance until all of the variance is accounted for by the analysis. The results of this study verified the model's requirements of common factor variance accountability.[6]

Figure 1 illustrates the pattern of the five-factor solution depicted graphically for this problem.

[6](SPSS Inc. SPSS User's Guide, McGraw-Hill Book Co., N.Y., 1983, p.. 657), and (Courtney, Analysis, 1984, p. 593)

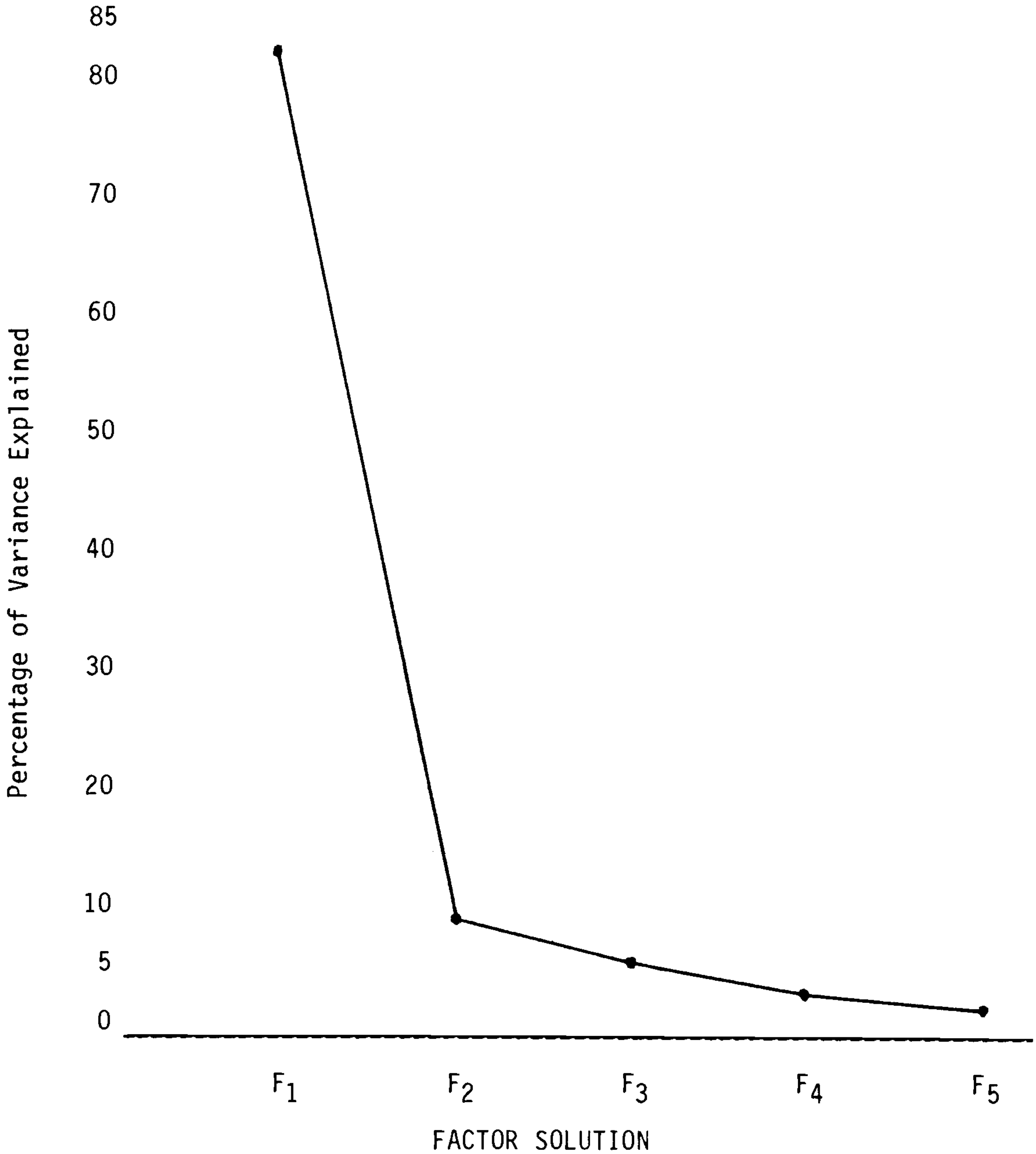


Figure 1. Percentage of common variance for the R-mode analysis.

# IV. CONCLUSIONS AND IMPLICATIONS

## Restatement of the Problem

The primary goal of the study was to ascertain the identity of research tasks which were appropriate to the job positions of public school administrators, secondary teachers, and elementary teachers in Oregon.

## The Dependent Variable

The dependent variable for the research was a scale score which was judgmentally assigned by each of the randomly selected respondents in the study. The scale covered six interval points, with respondents assigning an importance description to each of the thirty-five research oriented tasks.

## Reliability of the Instrument

The thirty-five item research instrument was developed with the assistance of a Delphi panel. A field test was conducted prior to data collection. The reliability was established using the analysis of variance procedure advocated by Hoyt and Stunkard (1952). The computed reliability for the instrument was +.974, a coefficient which provided a very high consistency indicator for the data collection device.

## Hypothesis Testing Conclusions

Analysis of variance was used to test for significance; there were a total of thirty-five hypotheses where three occupational groups means were evaluated. The hypothesis which was tested in each instance was $\mu_1 = \mu_2 = \mu_3$. The .05 level of probability was selected as the hypothesis criterion.

The resulting F tests indicated that twenty-five of the thirty-five hypotheses were in the rejection zone; ten of the null hypotheses were retained. Means ranged from 2.788 to 4.487 for Group A, 2.583 to 4.455 for Group B, and 2.366 to 3.481 for Group C. Standard errors ranged from a low of .112 (Group A) to a high of .156 for Group B. These levels of standard error were judged as appropriate to data originating from a six unit equal-appearing interval scale.

Four research tasks with mean scores above 4.000 were considered very important for curriculum inclusion. They are listed below:

| Task Number | Task Statement |
|---|---|
| 4 | Select appropriate standardized tests and instruments |
| 5 | Draw appropriate implications or generalizations from data analysis |
| 20 | Understand the capabilities of computer systems |
| 23 | Translate data analysis into recommendations |

Nine research tasks received mean scores in the range of 3.500 to 3.999, and were considered as important for curriculum development aimed at the sample population. These tasks are listed below:

| Task Number | Task Statement |
|---|---|
| 1 | Conduct necessary "non-instrument" data collection techniques, such as observation and interviews |

| | |
|---|---|
| 12 | Construct and use rating scales, checklists, questionnaires, interview schedules, and observation systems |
| 13 | Interpret computer output |
| 22 | Report research findings and implications |
| 24 | Collect data in a systematic manner |
| 26 | Understand measures of dispersion (percentiles, range, standard deviation) |
| 33 | Utilize methods of presenting data (charts, graphs, tables) |
| 34 | Understand measures of central tendency (mean, median, mode) |
| 35 | Use computer equipment for data analysis |

Recommended for consideration in curriculum planning are 15 tasks which received a mean of 3.000 to 3.499 and were considered as somewhat important to important by the total sample. These tasks appear below.

| Task Number | Task Statement |
|---|---|
| 2 | Identify factors which jeopardize internal and external validity |
| 6 | Evaluate research reports |
| 7 | Identify the sample of a research study |
| 8 | Determine the type of research (descriptive, historical, experimental) that should be utilized |
| 9 | Define general principles of instrument construction including reliability and validity |
| 10 | Write and submit proposals to obtain funding |
| 11 | State appropriate assumptions and definitions for a research study |
| 15 | Specify data necessary for testing an hypothesis |

| | |
|---|---|
| 16 | Understand the effect of measurement error on the precision of an experiment |
| 17 | Locate publication outlets for research reports, articles, or books |
| 18 | State the purpose and rationale for a research project |
| 21 | Assess feasibility constraints (time, access to subjects, control, money) which are associated in conducting a study |
| 25 | State the hypotheses in a research study |
| 27 | Organize the research process (hypothesis, evidence, inferences) |
| 32 | Apply appropriate statistical techniques for the analysis of a particular set of data |

Seven of the 35 tasks, which scored below 3.000, were considered as having little importance by the total sample population.

Those tasks with means above 4.000 were considered as being very important; those tasks with means from 3.500 to 3.999 as being important; and those ranging from 3.000 to 3.499 as being somewhat important. The tasks with means below 3.000 were considered as having little importance.

For curriculum planning by individual groups, the following findings were determined to exist.

Group A, school administrators, rated tasks 1, 4, 5, 12, 13, 20, 22, 23, 24, 33 and 35 above 4.000; tasks 2, 6, 10, 11, 16, 18, 21, 26, 27 and 34 between 3.500 and 3.999; tasks 3, 7, 8, 9, 14, 15, 17, 19, 25, 28, 30, 31 and 32 between 3.000 and 3.499. Only one task (number 29) was assigned a mean lower than 3.000.

Group B, elementary teachers, rated tasks 4 and 5 above 4.000; tasks 1, 12, 13, 23, 24, 26, 33, 34 and 35 from 3.500 to 3.999; tasks

2, 6, 9, 10, 15, 16, 17, 18, 19, 25, 28, 30, 31 and 32 from 3.000 to 3.499. There were 13 tasks with means below 3.000 for Group B.

Group C, secondary teachers, rated no tasks above 4.000; tasks 4, 5, 20, 23, 24 and 33 had means from 3.500 to 3.999; tasks 1, 2, 6, 9, 10, 12, 13, 15, 16, 17, 18, 22, 25, 26, 27, 34 and 35 had mean scores ranging from 3.000 to 3.499. Group C had 12 tasks with means below 3.000.

Group A respondents scored tasks at higher scale values than did the other two groups. Eleven of the Group A means were determined to be greater than 4.000. Group B rated thirteen means below 2.999 while Group C had twelve.

## Multiple Comparisons Testing

Tukey's $\omega$ method was used for pairwise comparisons analysis in instances where hypotheses were rejected in the analysis of variance testing. In all, a total of twenty-five tasks were analyzed by the procedure, with the pairwise comparisons method detecting positions of differences for twenty-four of the means. The results detected that the greatest numbers of differences occurred between Group A and C. Group B and C means were most nearly alike, differing on only four task statements.

## Factor Analysis Conclusions

The R-mode was utilized to generate a five-factor solution for clustering the thirty-five research tasks. The minimum factor loading was set at +.48; only four spurious tasks were identified when this loading criterion was applied to the data. All factors were positive.

The thirty-five task statements resulted in five factors; namely,

Factor I - General Research Knowledge (23 tasks)

Factor II - Tests and Instruments (5 tasks)

Factor III - Use of Computers (3 tasks)

Factor IV - Measures of Dispersions (2 tasks)

Factor V - Data Collection and Reporting (4 tasks)

## Implications

Implications form the basis for practical application of the findings; they are formulated from both the related literature research and the data analyses. The practical considerations evolving from the results of the present study include:

1. Mean score values indicate the importance level for each task. It seems appropriate to suggest that, based upon the resultant means, twenty-eight of the tasks be included in curriculums which prepare personnel for employment in the three occupations. Seven task means fell below the 3.000 level; these were considered as having little importance to curriculum development. Tasks with means which were found to be greater than 3.500 should be required for inclusion in teacher preparation programs as well as in college and university graduate programs. Tasks with values ranging from 3.000 to 3.499 are recommended for inclusion in such curriculums.

2. Clusters of tasks formulate the basis for instructinal planning. Content of courses offered in college and university programs should be structured in such a way as to

project the teaching of content according to the tasks included in each factor.

3. Secondary and elementary school teachers rated tasks more nearly alike than did administrators. It would seem logical to suggest that many of the tasks included in this study form courses or instructional situations whereby secondary and elementary teachers can be grouped for instrucional purposes.

4. The methodology of analysis of variance, multiple comparisons testing, and factor analysis matches the analytical requirements for research involving occupational task determination. This methodology should be encouraged as a means of obtaining data for purposes of curriculum planning.

## Suggestions For Further Study

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

1. Research should be conducted to determine the quantity and quality of research courses required in Oregon's colleges and universities at the Master's and higher level degree programs.

2. Curriculum change is inevitable due to social, economic, and political demands; therefore, this study should be replicated periodically to verify existing curriculum needs.

3. It is recommended that when this study is replicated, a second measurement scale be included to measure the respondent's perceived importance of a task, in addition to

the perceived needs to the job position.

4. The cognitive levels of those tasks which were included in the present research should be identified in a future study.

5. A study should be conducted to measure the correlation between the teaching and use of statistics with a negative attitude toward research in general.

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# APPENDICES

# APPENDIX A

## DELPHI PANEL MEMBERS

1. Elinor Bick----------Secondary reading specialist
2. Lowell Bick----------School administrator
3. Robert Clemmer-------Department of Education
4. Jerome Colonna-------Counselor
5. Frank Cross----------Oregon State University
6. Alan Davis-----------Counselor
7. Ray Hajduk-----------School administrator
8. Sandy Howard---------Elementary Teacher
9. Tom Howard-----------School administrator
10. Neal McBride---------Counselor
11. Wanda Monthey--------Department of Education
12. Carol Roush----------Secondary Teacher
13. Gary Roush-----------Elementary Teacher
14. Chuck Sixberry-------Elementary Teacher
15. Joyce Sixberry-------Secondary Teacher
16. Sam Stern------------Oregon State University
17. David Thomas---------Oregon State University
18. Eugene Vinarskai-----Department of Education

# APPENDIX B

ID:_____

## RESEARCH TASK ANALYSIS

Instructions: Listed may or below are 35 research tasks which may not be important to you in your present position. Please rate each item carefully, based on its importance to you, by circling the appropriate number to the right.

| | Very little importance | Little importance | Somewhat important | Important | Very important | Extremely important |
|---|---|---|---|---|---|---|
| 1. Conduct necessary "non-instrument" data collection techniques, such as observation and interviews . . . . . . . . . . . . . . . . . . . . | 1 | 2 | 3 | 4 | 5 | 6 |
| 2. Identify factors which jeopardize internal and external validity . . . . . . . . . . . . . . . . . . | 1 | 2 | 3 | 4 | 5 | 6 |
| 3. Obtain information through Dissertation Abstracts, Indices, and data-based computer retrieval systems . . . . . . . . . . . . . . . . . . | 1 | 2 | 3 | 4 | 5 | 6 |
| 4. Select appropriate standardized tests or instruments . . . . . . . . . . . . . . . . . . . . . | 1 | 2 | 3 | 4 | 5 | 6 |
| 5. Draw appropriate implications or generalizations from data analysis . . . . . . . . . . . . . . . . | 1 | 2 | 3 | 4 | 5 | 6 |
| 6. Evaluate research reports . . . . . . . . . . . . . | 1 | 2 | 3 | 4 | 5 | 6 |
| 7. Identify the sample for a research study . . . . | 1 | 2 | 3 | 4 | 5 | 6 |
| 8. Determine the type of research (descriptive, historical, experimental) that should be utilized . . . . . . . . . . . . . . . . . . . . . . | 1 | 2 | 3 | 4 | 5 | 6 |
| 9. Define general principles of instrument construction, including reliability and validity | 1 | 2 | 3 | 4 | 5 | 6 |
| 10. Write and submit proposals to obtain funding . . | 1 | 2 | 3 | 4 | 5 | 6 |
| 11. State appropriate assumptions and definitions for a research study . . . . . . . . . . . . . . . . . | 1 | 2 | 3 | 4 | 5 | 6 |
| 12. Construct and use rating scales, checklists, questionnaires, interview schedules, and observation systems . . . . . . . . . . . . . . . | 1 | 2 | 3 | 4 | 5 | 6 |

13. Interpret computer output . . . . . . . . . . . . . 1 2 3 4 5 6

14. Apply sampling theory and techniques, including variations of simple random sampling. . . . . . . 1 2 3 4 5 6

15. Specify data necessary for testing an hypothesis 1 2 3 4 5 6

16. Understand the effect of measurement error on the precision of an experiment . . . . . . . . . . . 1 2 3 4 5 6

17. Locate publication outlets for research reports, articles, or books . . . . . . . . . . . . . . . 1 2 3 4 5 6

18. State the purpose and rationale for a research project . . . . . . . . . . . . . . . . . . . . . 1 2 3 4 5 6

19. Apply techniques for increasing precision in research designs . . . . . . . . . . . . . . . . 1 2 3 4 5 6

20. Understand the capabilities of computer systems . 1 2 3 4 5 6

21. Assess feasibility constraints (time, access to subjects, control, money) which are associated in conducting a study . . . . . . . . . . . . . . . 1 2 3 4 5 6

22. Report research findings and implications . . . . 1 2 3 4 5 6

23. Translate data analysis into recommendations . . 1 2 3 4 5 6

24. Collect data in a systematic manner . . . . . . . 1 2 3 4 5 6

25. State the hypotheses in a research study . . . . 1 2 3 4 5 6

26. Understand measures of dispersion (percentiles, range, standard deviation) . . . . . . . . . . . 1 2 3 4 5 6

27. Organize the research process (hypothesis, evidence, inferences) . . . . . . . . . . . . . . 1 2 3 4 5 6

28. Use randomization and sample selection as a means of experimental control . . . . . . . . . . . . . 1 2 3 4 5 6

29. Identify properties of nominal, ordinal, and interval measurement scales . . . . . . . . . . . 1 2 3 4 5 6

30. Establish confidence levels in the testing of hypotheses . . . . . . . . . . . . . . . . . . . 1 2 3 4 5 6

31. Specify appropriate independent and dependent variables for a study . . . . . . . . . . . . . . . 1 2 3 4 5 6

32. Apply appropriate statistical techniques for the analysis of a particular set of data . . . . . . 1 2 3 4 5 6

33. Utilize methods of presenting data (charts, graphs, tables) . . . . . . . . . . . . . . . . . . 1 2 3 4 5 6

34. Understand measures of central tendency (mean, median, mode) . . . . . . . . . . . . . . . . . . 1 2 3 4 5 6

35. Use computer equipment for data analysis . . . . 1 2 3 4 5 6

RESPONDENT INFORMATION

| Sex: | Age: | Highest degree completed: |
|---|---|---|
| _____Female | _____20-30 | _____Master's |
| _____Male | _____31-40 | _____Doctorate |
| | _____41-50 | |
| | _____51-60 | |
| | _____over 60 | |

# APPENDIX C

September 12, 1983

Dear Colleague:

The School of Education at Oregon State University is updating the curriculum in the area of educational research in order to meet the current needs of the educational community. The tasks required in conducting and utilizing research are numerous. Which ones, then, are most important and should be included in a curriculum? Your experience and opinions are highly valued in this important endeavor.

You are among a small group of randomly selected educators representing elementary and secondary teachers, secondary counselors, school administrators, State Department of Education professionals, and college and university instructors being asked to give their opinions; therefore, your response takes on added importance.

We want to assure you that confidentiality is being maintained. The questionnaire has an identification number for mailing purposes only, allowing us to check your name off of the mailing list when your questionnaire has been returned. In order for your responses to be carefully considered, we would appreciate having the questionnaire sent back not later than one week from today. An addressed, stamped envelope has been provided for your convenience.

The results of this research will be made available to individuals involved in curriculum planning at Oregon's educational institutions. You may receive a summary of results by requesting one through the Dean's Office in the School of Education after December 15, 1983.

Thank you for your assistance.

Sincerely,

| | | |
|---|---|---|
| Robert D. Barr | Margaret A. Soukup | H. James Burton |
| Dean | Project Co-Director | Project Co-Director |

# APPENDIX D

October 5, 1983

Dear Colleague:

About three weeks ago I wrote to you seeking your opinion on the importance of specific tasks required in conducting and utilizing educational research. Your responses will be used to help shape and update curriculum in educational research at Oregon State University. As of today I have not yet received your completed questionnaire.

I am writing to you again because of the significance each questionnaire has to the usefulness of this study. Your name was drawn through a scientific sampling process in which every secondary counselor, State Department of Education professional, and state college and university instructors in Oregon had an equal chance of being selected. In order for the results of this study to be truly representative of the opinions of these groups of educators it is essential that each person in the sample return the questionnaire.

If you have already completed and returned your questionnaire, please accept my sincere thanks. In the event that you did not receive a questionnaire, or it got misplaced, I have enclosed another questionnaire and an addressed, stamped envelope for your use. Please complete it today and mail it back to me tomorrow.

Your contribution to the success of this study is greatly appreciated.

Sincerely,

H. James Burton
Project Co-Director

Enclosures (2)

# APPENDIX E

Dear :

Thank you for your willingness to contribute your time and expertise to a research project that may enhance curricula updating at Oregon State University.

As a member of a Delphi panel your role is to determine what people in your field believe to be important tasks required in educational research and related activities. The basis of the Delphi method is expert informed intuitive judgment.

The Delphi method was developed in the 1950's by the Rand Corporation under the direction of Olaf Helmer. The Delphi procedure is as follows:

1. Each Delphi panel member is provided a list of tasks that may be required in educational research. Feedback provided by panel members is the basis for selecting items that will be included in the main research questionnaire.

2. Each member is asked to analyze and evaluate each item with the purpose of deciding whether to RETAIN, REJECT, or REVISE the statement. It is important that each member adds any task he/she feels is important to educational research that has not been included.

3. The second list of tasks is to be generated from the analysis of the first evaluation by the Delphi panel.

4. If needed, a third list will be provided for panel consideration in order to reach consensus on items to be included on the final questionnaire.

We appreciate your interest in research leading to educational improvement. Please return this list within three days to help us maintain our tight time schedule. We appreciate this extra consideration. A self-addressed envelope is provided.

Sincerely,

| | | |
|---|---|---|
| E. Wayne Courtney<br>Professor | H. James Burton<br>Project Co-Director | M. A. Soukup<br>Project Co-Director |

# APPENDIX F

Dear :

Thank you for your meaningful comments on Round I. We were very pleased with the consensus of opinion regarding items. At this time it appears as though it will require only two rounds to complete our instrument.

Several of the items have been revised as recommended, while a few were rejected and have been omitted. In this round we are asking you to place a value on the remaining tasks according to its importance in your job setting. We are using a scale of one to six, one being low or of little importance, six being of highest value. Please circle the number which best represents the value that you would assign the item.

Again, time is of the essence, so please complete and return the evaluation as soon as possible. We would appreciate your having them in the mail by August 5.

Sincerely,

| | | |
|---|---|---|
| E. Wayne Courtney | H. James Burton | M. A. Soukup |
| Professor | Project Co-Director | Project Co-Director |

APPENDIX G

TO:

FROM: J. Burton and M. A. Soukup

DATE: August 16, 1983

RE: Round Three

After analyzing the results of Round Two, it became apparent that once again we needed your expert opinion on some items in the questionnaire that the panel felt were redundant.

For your consideration, we have grouped items that appear to be closely related research tasks. By this process, we hope to select the most appropriate items for inclusion in the final questionnaire, and delete those items which are redundant.

Listed on the attached pages are the items which have been grouped into related areas with the values in parentheses to the left that the panel members assigned in Round Two, on a scale from 1 (low) to 6 (high).

Round Three includes those items that were revised or accepted as they were. Items rejected in earlier rounds have already been deleted.

Critically evaluate the following items. If two or more items mean the same thing, accept the most appropriate research task statement and reject the weakest.

Again, we would appreciate your completing and returning the questionnaire as soon as possible. The date for completing the final instrument is drawing near.

APPENDIX H

## FIELD-TEST INSTRUCTIONS

Please read the instructions on the following page and respond to them as if you had received this questionnaire in the mail. After completing the questionnaire, use this page to critique the instrument in terms of readability, clarity of instructions, format, or any other observations about the instrument that you would care to share.

Thank you for helping to evaluate the questionnaire in this last critical stage of development.

* * * * * * * * * *

Comments: (Both positive and negative)

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