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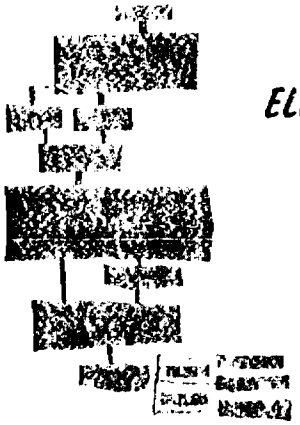
ABSTRACT

This report describes 3 years of research on identifying, categorizing, and comparing teachers' ideas about teaching. The study used two different groups of 32 Wisconsin elementary school teachers selected according to a stratified random sampling procedure. The first group of teachers participated in a taped 2-hour interview on their ideas about teaching. From the interview tapes, "content units" containing specific ideas about teaching procedures were identified. The second group of teachers was then asked to sort the content units into categories according to the similarities and dissimilarities which they discriminated among the units and express the substantive meaning which they attached to each category. A latent partition model was then used to identify 32 categories perceived by the teachers. Several replications of this experiment were made using single-word verbs associated with teaching as the content units. This made possible faster sorting and computerized analysis of the data. In addition a questionnaire was administered in which teachers evaluated the contribution to learning of each of the content units. (The document contains samples of all materials used in the project including a sample sorting kit.) (FT)



ELEMENTARY SCHOOL TEACHERS' VIEWPOINTS OF CLASSROOM TEACHING AND LEARNING

A Research Report to the
U. S. OFFICE OF EDUCATION

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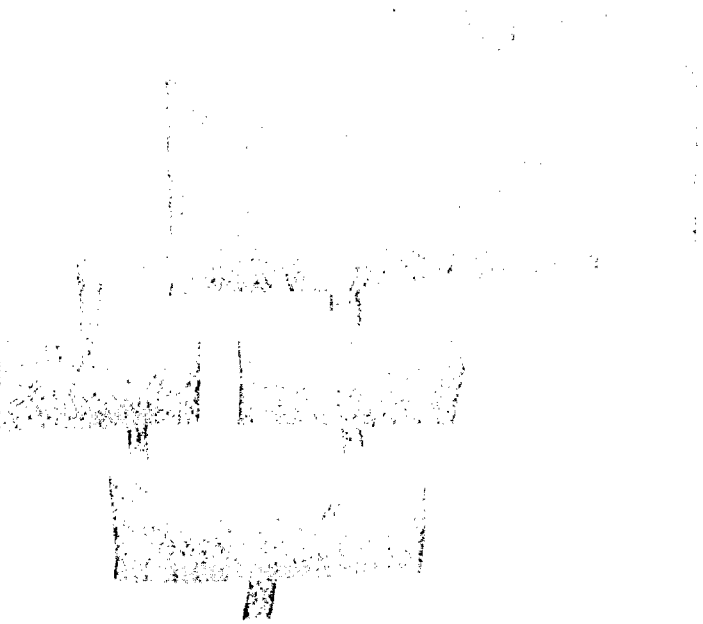

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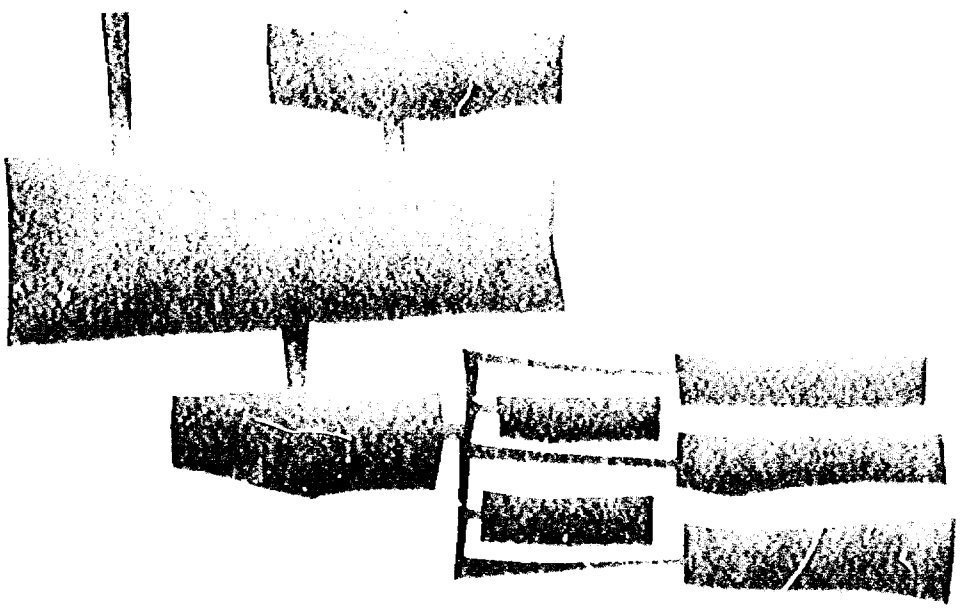

PREFACE

It is increasingly clear that the cognitive aspects not only of learning but also of teaching must have much more thorough examination and analysis than have been made in the past. It also seems clear that teachers themselves can profit most by both leads and value data concerning the perceptions which their work as stimulators of and companions and guides to learning demands.

Incisive studies of the behaviors of teachers along with similar examination of the characteristics of the teacher are essential towards increasing the effectiveness of teaching. Also it must be realized that not only the acquisition of facts is important, but equally important is the development of skills in the optimum and maximum utilization of facts. Much more and sharper inquiry is also required with respect to the "feelings," "motivations," and "satisfactions" of teachers especially as reflected in the emotional and social behavior of children.

The study hereby presented is a significant contribution for all those connected with educational institutions but particularly for those whose efforts are devoted to what traditionally has been termed "teacher training". Although all of the findings per se are significant, the basic worth of this work lies in the fact that a new procedure for studying the cognitive characteristics of teachers and teaching has been developed. However, as the writers of this report succinctly suggest, the real contribution of the pattern of study presented in the report can be evaluated only by further research - that is, inquiry which utilizes the pattern of investigation found in this study.

As the title page reveals, a relatively large number of people made significant contributions to the close scrutiny of elementary school teachers' viewpoints of classroom teaching as presented in this document. But as is always the case, a single individual must in a sense "carry the ball." With respect to this work, that individual is Donald M. Miller whose high ability and skill in the ways and means of carrying on basic research is matched by extraordinary persistence and a capacity for expending indefatigable effort.

It is hoped that in the near future many others will test the value of the procedures reported in this work and make available the findings of their efforts. The opportunity to have been associated with this report has been valuable and eye-opening to the writer and is an opportunity that is prized.

John Guy Fowlkes

FOREWORD

Why should researchers attempt to explicate and classify ways in which elementary teachers think about facilitating learning? There are three important reasons:

1. The behavior of teachers is determined by their own perceptual processes,[1]
2. Changing the behavior of teachers depends upon understanding how they think, and
3. The thoughts, ideas, and experiences of teachers comprise a rich source of information about the socio-psychological realities of the classroom.

A prime purpose for such explication and classification is the recognition that not all teaching-learning situations are alike. All classroom situations cannot be treated as equal. The use of one teaching approach may be effective in one situation but not another. Teachers repeatedly voice a need for patterning their instructional techniques to particular students. For example, a method for teaching English to a disadvantaged fourth grade boy is unlikely to be appropriate or effective for teaching a different fourth grade boy from another socio-economic level.

If a teacher is to pattern his instructional approach to the characteristics of various teaching-learning situations, he must perceptually and conceptually differentiate among these various situations. Some of the recent reforms in educational organization and instructional techniques highlight the importance of identifying the qualitative differences among teachers' views of the teaching-learning process. Can teachers organized in teams be expected to follow the same classroom procedures that they followed when each was responsible for a self-contained classroom? Can a teacher who is instructionally responsible for a non-graded group of students be expected to follow the same procedures used when teaching a "graded" classroom?

This project was initiated as an effort to investigate whether elementary school teachers working in teaching teams held views of the facilitation of learning different from those of teachers who were instructing in self-contained classrooms. For similarities and differences between these two kinds of teachers to be objectively described, an appropriate research methodology was needed. Unfortunately, efforts made to observe, record, or reflect upon the substance and structure of teachers' operational views about facilitating learning have been exceedingly sparse. Moreover, few of the standard social science research methods were deemed useful for considering the perceptions and thought structures of teachers'

[1] For a survey of the relationships between perception and behavior, see Bernard Berelson and Gary Steiner, Human Behavior: An Inventory of Scientific Findings, 1964.

views. For these reasons, it become necessary to allocate a large segment of project resources to establish more appropriate experimental methods and to evaluate the implications of such methods.

The substantive focus of the study was the content domain of teachers' views of classroom behaviors and events and of the facilitation of learning. The perceptions and cognitions of any one teacher were conceived as a small sample of this content domain. The total domain would include the relevant perceptions of all elementary school teachers. Hence, the research was not concerned with investigating the views of particular teachers or of a particular group of teachers. The goal was to provide an unbiased description of the content domain to which each teacher could contribute his own viewpoints, thoughts, ideas, and experiences.

The researchers hoped that a study of this domain would provide valuable knowledge of cognitions and perceptions which teachers held in common and differences among their cognitions and perceptions. It was essential in this research to develop a system for classifying teachers' perceptions and cognitions. This project was predicated on the notion that, although there are extensive individual differences among elementary teachers, they share many common perceptions and cognitions.

This shared-but-individualistic quality of teachers' perceptions of learning is somewhat analogous to what we know of the similar-but-varied character of snowflakes:

> Perhaps the first and most important fact about the snow crystal that impresses itself on the careful student is the usual similarity of its general shape, while the second fact to be noted, also of great importance, is the endless variety in the details of its structure. These details have been the basis of several classifications of the crystal...[1]

The effect of this conceptualization on the research was the formulation of the hypothesis that teachers' views may be characterized along qualitative dimensions of perceptions and cognitions. Thus the methodological objective was to develop an approach to differentiate, qualitatively, the substantive and structural dimensions of teachers' views. The goal was to manifest and explicate the similarities and differences among a wide variety of teachers' perceptions of the facilitation of learning. The measurement techniques for making these qualitative differentiations were created in direct response to the demands of the overall project objective.

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[1] From W. A. Bentley and W. J. Humphreys, Snow Crystals, 1931.

Thus the unique contribution of this project is perhaps its development of a methodology--a coregorization methodology--for explicating the substance and structure of teachers' perceptions concerning classroom teaching and learning.

Not only has this research provided an approach to investigating the similarities and differences of teacher views, but it has produced several other outcomes as well:

1) The research makes visible the substance of teachers' thinking regarding the facilitation of learning.
2) The research permits the observation of the structure of teachers' perceptions and cognitions of teaching and learning.
3) The methodology which was developed provides an approach to investigating the characteristics of thinking in a variety of areas.
4) The methodology is applicable to a variety of content domains in the social sciences.

To produce the outcomes, a diverse set of resources was assembled and coordinated--time, talent, effort, and funds were the essential ingredients of the work. To list the individuals who contributed to the substantative aspects of the work would involve listing the names of more than 900 teachers, 200 administrators, and the names of their corresponding school buildings and districts. The researchers wish to acknowledge with deep appreciation the cooperation of the school people by geographically identifying the participating groups of individuals; the state map at the end of this Foreword locates each of these groups. As the map shows, cooperation was granted by people scattered widely throughout Wisconsin. This geographic diversity was intentional; the researchers sought a small amount of assistance in each locale but they asked the help of people in many locales.

While the school people contributed the substance of this report, the methodology was made possible by cooperation from many individuals and groups of people who functioned as a team even though they were in many positions. Historically, initial assistance on research methodology was provided by Professor Julian C. Stanley and the Laboratory of Experimental Design of the University of Wisconsin. Shortly thereafter, assistance from the Wisconsin State Department of Public Instruction, and especially from Archie A. Buchmiller and Donald E. Russell, made it possible to define precisely the teaching population in the State of Wisconsin. For the development of sampling procedures and for later computations, the

University of Wisconsin Computing Center provided additional support which was made possible through the National Science Foundation and the Wisconsin Alumni Research Foundation. Persons associated with the Wisconsin Improvement Program also contributed to the research effort.

Many individuals have contributed in special ways. We especially wish to thank Richard Goranson, Ann Gordon, Bruce Gregg, Robert Lane, Ted Lemke, and David Nositir. We also appreciate the help of the U.S.O.E. coordinators: Glen Boerrigter, William Carriker, and Francis Ianni.

The researchers especially wish to express appreciation for the service and patience of their secretaries; Emmy Alford and Dorothy Haugum have been especially helpful. Assistance in preparing the final manuscript was given by Marla Howell, and Shelby Johnson provided editorial help. We wish to thank Carol Cowan and Walter Johnson for their valuable assistance in producing the final document.

GEOGRAPHICAL DISTRIBUTION OF PARTICIPATING SCHOOL DISTRICTS

N=89

LEGEND

o identifies districts selected by the random stratified sampling procedure (n=32)

x identifies other participating districts (n=57)

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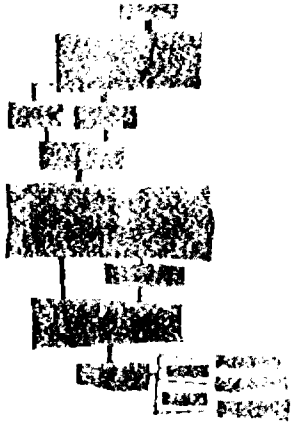

PART I

Overview of the Research

CHAPTER I

THE OBJECTIVE AND GENERAL METHODS OF THE RESEARCH

The central research objective of this project was to describe the substance and structure of experienced teachers' views of facilitating student learning in the elementary classroom. The term "views" is used here as a general label for the set of a teacher's perceptions and cognitions concerning his behaviors and experiences in the classroom, as they relate to facilitating learning. Primarily, then, the research focus was the cognitive views of teachers. Specifically, the research was concerned with only those perceptions and cognitions based on a teacher's experiences which he could record or express in an observable form. As examples, a teacher's reporting of his perceptions and cognitions might include an idea he used in arranging the physical classroom environment, or a particular way in which he thought about establishing rapport with students, or a description of an instructional practice he used in teaching reading.

The purpose of this chapter is to discuss the project in terms of this central research objective and to describe the empirical methods used in conducting the research. Discussion will concern the nature of the problem studied, the character of the research approach, the empirical procedures of the investigation, and will present an overview of the outcomes of the project. To accomplish this, the chapter is divided into two aspects: in the first aspect, three sections will outline the nature of the problem and the research issues, and discuss the relevance--to the major objective--of experience in teaching. In the second aspect, particular attention will be given to the procedures required for observing and recording the views of a single teacher and to the problem of considering the common features of the views of several teachers.

A. THE NATURE OF THE PROBLEM

Consider the differences between the classroom teaching behaviors of an experienced teacher and the classroom teaching behaviors of a teacher-in-training. An experienced teacher, in comparison with a novice, handles a wide variety of daily classroom contingencies and events with sensitivity and smoothness. Throughout the school year, he coordinates and sequences many different kinds of activities designed to facilitate learning. The daily efforts of an experienced teacher display knowledge, understanding, and skill. He has distilled from his experiences and learnings a matured style and a unique approach to teaching. What is the nature of an experienced teacher's views? What is the nature of his understanding of classroom teaching?

In contrast, an inexperienced teacher may interact more hesitantly with his students. He might be able to coordinate some activities but not others. His style and approach have not matured. Gradually, as he gains experience, he accumulates understanding, knowledge, and skill until his mastery is more general. What views of teaching and learning has an experienced teacher distilled from the history of his efforts and actions?

An experienced teacher has distilled an orderly cognitive pattern which allows him to synthesize, to coordinate, and to sequence a tremendous variety of instructional circumstances and events. He demonstrates thoughts and actions which have been matured by the social-psychological realities of the classroom. He attends to certain situations rather than others. He has learned to be selective, for he has found that it is neither possible nor necessary to attend to all things. He is able to pattern his behavior so that order and progress are achieved. An observer may watch the experienced teacher at work and describe the richness of the teacher's skill from an external vantage point. But how does an experienced teacher perceive his own actions; how does he conceptualize his efforts to stimulate and direct learning?

These statements and questions reflect the fundamental concern of the project for investigating the substance and structure of teacher viewpoints. In conducting empirical research appropriate to this concern, it was necessary to observe, record, and analyze information validly reflecting a teacher's own views of facilitating learning in the classroom. Since the function of this document is to report the scientific procedures employed in this investigation, the report does not include an in-depth rationale for the significance of a teacher's perceptions. Nevertheless, to highlight the nature of the research problem, it is essential to make several statements about the importance of a teacher's views about facilitating learning.

Two major reasons will be offered for an understanding of the importance of a teacher's perceptions and cognitions regarding the facilitation of learning. One reason is that the perceptions and discriminations of a teacher exert critical influence on the stimulation and direction of student learning. It is a teacher's own thoughts and conceptualizations of the instructional process which mold and control the learning climate. Perceptual or phenomenological psychology evidences that individual human behavior

is directed by the individual's perceptions.[1] This scientific postulate implies a second major reason for investigating the views of teachers. To improve the performance of teachers, and to accumulate a body of knowledge relevant to facilitating learning, information is needed which describes the views and perceptions of teachers. A program for increasing effectiveness of teachers must take into account their existing perceptions concerning teaching and learning.

The sole aim of this project was to describe teachers' views and to see the classroom from their viewpoint, in their own terms. Given this aim, the research required the derivation and use of appropriate procedures for observing, recording, and analyzing the substance and structure of teachers' views. The following two sections delineate the concepts of substance and structure to provide a framework for presenting an overview of the research methodology.

b. SUBSTANCE OF A TEACHER'S VIEWS

There are two ingredients in the substance of a teacher's views: the content unit; and the percept, which is the perceived meaning of a content unit. In the following pages these two terms will be defined in detail, for they are essential vocabulary throughout the remainder of this report.

Definition of Content Unit

A content unit is a record of a teacher's description of a classroom-relevant behavior--including thinking--in which the teacher has engaged, or of an event which he has experienced. The content unit records a teacher's own report of a classroom behavior or event which he considers relevant to facilitating learning. The characteristics of a content unit are intrinsic unity, reference to a molar rather than a molecular behavior or event, and directedness or purposiveness with respect to facilitating learning.[2]

This definition carries several implications for the conditions under which data may be obtained. The critical condition for observing and recording content units is to provide a situation in which a teacher has the opportunity to express his perceptions and cognitions of classroom-relevant behaviors and

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[1] For a detailed presentation of this postulate see A. W. Combs and D. Snygg, Individual Behavior: A Perceptual Approach to Behavior, 1954 rev.

[2] The problem of defining and characterizing a unit of observation such as a content unit has been discussed in detail in The Midwest and Its Children, by R. G. Barker and H. F. Wright, 1956.

svents. Such o situation would allow the teacher freedom to

a) select the kinds of behaviors and events to be described,

b) determine the manner of description, and

c) express the relevance of the behavior or event for facilitating learning.

In summary, the preparation of content units needed to be accomplished under conditions which allowed a teacher to express his own thoughts in his own way.

Methods of Obtaining Content Units

Content units may be obtained from a variety of sources and by a variety of methods. Five possible methods are presented below:

Method 1. Lesson Plan Reports. Content units might be obtained from a teacher's lesson plans, wherein he has stated the steps he uses in particular classroom lessons.

Method 2. Autobiographic Writings. A content unit might be derived from a teacher's writings, in which the teacher has reflected on his approach to teaching and has described particular techniques he has used.

Method 3. Interview Recordings. Content units may be accumulated from a tape-recorded interview in which the teacher discusses his work in the classroom.

Method 4. Content Analysis of Reports. This method of preparing content units might involve a teacher in a formal, unstructured report of classroom behaviors and events.

Method 5. Essays. In this method, a teacher might be directed to write short essays about his approach to classroom instruction. Content units could then be derived from the essays.

Examples of content units obtained from these five methods are presented in Table 1.1. Study of these examples indicates that the individuality of a teacher is manifested in different degrees by different methods. The clearest differences among methods are those of the degree to which the form and style of expression are preserved. Lesson Plan Reports seem to provide little opportunity for detail or for specific description of particular behaviors and events. Autobiographic Writings demand fluency of written expression. Interview Recordings allow free expression but often result in disjointed descriptions. The Content Analysis of Reports reduces and fragments the richness of a teacher's discussion. Essays enable

TABLE 1.1

SAMPLE CONTENT UNITS OBTAINED BY FIVE METHODS

METHOD 1. Lesson Plan Reports (from a lesson plan workbook of a Wisconsin teacher)

Content Unit A:

Teacher Activities:
1. Guide oral discussion
2. Provide and clarify facts as needed
3. Elicit information and facts from pupils

Content Unit B:

Procedure for a Reading Lesson:
1. introduce
2. motivation
3. vocabulary work
4. comprehension assignment

METHOD 2. Autobiographic Writings (from Teacher by Sylvia Ashtan-Warner, reproduced with the permission of Simon & Schuster)

Content Unit A:

I burnt most of my infant-room material on Friday. I say that the more material there is for a child, the less pull there is on his own resources.

Content Unit B:

Sometimes I relax the children with eyes closed to dream. When they awake I hear these dreams. The violence of those has to be heard to be believed. A lot of it is violence against me--which they tell me cheerfully enough. I come out very badly. My house has been burnt down, bombs fall on me, I'm shot with all makes of guns and handed over to the gorilla.

METHOD 3. Interview Recordings (from a transcription of a tape-recorded interview with a teacher)

Content Unit A:

... or I will be guiding their thinking, science. Perhaps the science sheet that they'd be working on--the story is above, the questions are below and they are way off track on their answers. As we go back up into the story you find out where it tells something about that answer, then they will get the paragraph that is talking generally about that. Now let's find out what does the question say or read the question out loud. Now we've got to answer the question. Usually we get stuck on the how. It is how, why, when, or where and he'll answer a how question when it should be a why question. Now I ask him to read it over again, keep reading it over again till he puts the why in there--it doesn't say how it says why. And he discovers it himself.

METHOD 4. Content Analysis of Reports (from the formal summarization of a tape-recorded interview)

Content Unit A:

This teacher just follows the spelling workbook.

Content Unit B:

This teacher, in desperation of teaching the difference between the b and d, told the class that the b comes first in the alphabet so the line comes in front. She feels that each problem is an individual problem and she needs to try all methods for mastery.

METHOD 5. Essays (from an essay, "My Approach to Teaching," by a Wisconsin teacher)

Content Unit A:

We try to bring personal experiences into the classroom. That leads to more interest and more pupil contribution and participation. It is important to have all participate, it promotes self-esteem and self-confidence. Children have to have that if they are to learn. A child who feels ignored and left out will not put forth effort.

Content Unit B:

As we introduce each new unit we do vocabulary work, also a lot of map work. We try to find extra interesting material for each unit. We use comparison with our way of life and bring in personal experiences. Visual aids help very much in social studies.

the teacher to express his ideas freely, but they typically occasion general and abstract descriptions. It may be concluded that no single method is completely satisfactory in terms of the project.

The advantages and disadvantages of these methods for obtaining content units illustrate aspects of an important methodological problem. On one hand, the research requires that a teacher be given the opportunity to express his ideas in terms of his own individuality. On the other hand, a method which would allow excessive latitude in reporting would lead to difficulties in the systematic preparation and manipulation of content units. The most desirable method would be one which would allow teachers freedom in reporting but which would allow standardization of the form of response, so that coding of the units could be economical and efficient.

The method finally formulated was a combination of Method 3, Interview Recordings, and Method 4, Content Analysis of Reports. This involved summarizing the content of tape-recorded interviews with teachers. These summarizations were carried out by teachers trained in standardized procedures. To further illustrate the nature of the content units which resulted from this method, some examples are given in Table 1.2. These examples have been selected to indicate the range and variety of content units obtained.

Definition of Percept

A percept is the meaning which a teacher ascribes to a particular content unit. It is "a single perceiving; a unit of the perceiving response," (English and English, 1958). It is a teacher's internal symbolic summarization of the meaning which he perceived in the content unit. Theoretically, the formation of a percept proceeds according to the process of perceptual differentiation. This process, according to perceptual psychology, is a function of the "condition of stimulation, the reception, and the prior experience of the perceiver" (Forgus, 1966). By this process, some details of an object such as a content unit are more clearly perceived than other details.

Perceptual differentiation is often described in terms of a figure-ground relationship.[1] The

[1] See for example, E. R. Hilgard, Introduction to Psychology (Third Edition) 1962.

TABLE 1.2

CONTENT UNITS PREPARED BY SUMMARIZING INTERVIEW RECORDINGS

A. This teacher catches mistakes children make as they make them by walking around the room, because it saves reteaching the next day.
B. This teacher never tells students the right answer. She answers a question of how to do it with a question, or guides them on how to find the answer.
C. This teacher has the children read a story three times because she wants the student to read it the first time to get the gist of the story, the second time for details and main ideas, and the third time to enjoy it and to get expression.
D. This teacher believes children should profit from their mistakes and should learn to prevent future mistakes.
E.* This teacher wants to help those who show evidence of leadership to have confidence and to use their leadership ability.
F. This teacher encourages all activities to come back to reading because this is the most important subject in the second grade.
G. This teacher has asked the other children to help a girl by explaining the right way to play instead of shunning her because she wants her own way.
H. This teacher, when a child has read a story and has not understood it, has him reread it, look at every word without moving his lips, and then she asks questions of varying levels of generality of the child who has reread the story.
I. This teacher marks A, B, C, and D because the school requires such grading, but she does not feel that these grades are adequate because they are not good steps.
J.* This teacher doesn't like time tests. She would rather have a child work at his own speed, because she was no speed-demon.
K.* This teacher uses film strips to teach a lesson which is difficult to visualize and broadens out the discussion from the film strip.

Note: Starred items were used in a major experiment, reported in Chapter 12.

"figure" refers to those details of the object which the perceiver is most clearly aware of and holds as most meaningful. The "ground" refers to those details of the object which the perceiver is relatively unaware of and which lack clarity. A common example of the figure-ground phenomenon is a geometric figure,  , which, through changes in awareness of sub-sets of the details, may be found to contain all the letters of the English alphabet.

The figure-ground concept may be used to clarify the meaning of the term percept. When a teacher initially apprehends a content unit, the description it contains forms the basis for the "ground" of the teacher's perception. Continued attention to the description by the teacher will result in a differentiation of the details of the content unit. The result of this differentiation will be the awareness of a "figure," which may be cognitively transformed into a percept. For example, a content unit might be a description of a particular procedure used in teaching students new words in spelling.

> Content Unit A
>
> After pronouncing each of the new spelling words with the class, I have the students write each of the words three times in their spelling notebooks.

As a teacher apprehends and surveys the details of this content unit, he will begin to form an understanding by differentiating the details which are most meaningful to him. As a result of this differentiation of the "figure-ground" relationship, he will formulate his percept of the content unit. In this case, he may label his percept as "Drill in Spelling." This transformation process is illustrated in Figure 1.1.

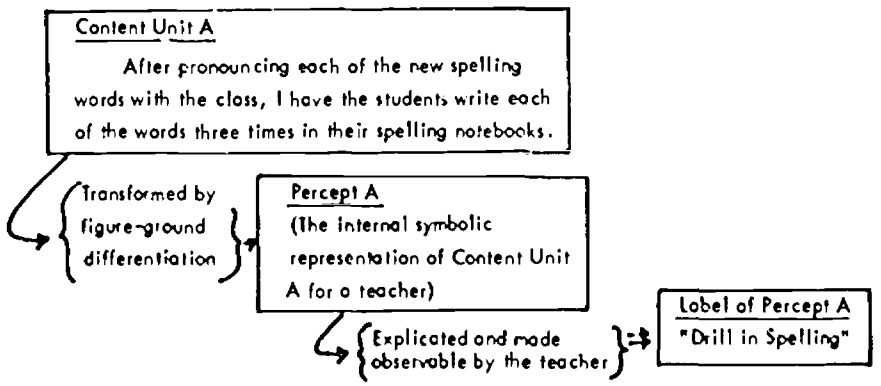


Figure 1.1 Schematic representation of forming and labeling percepts.

A percept is not directly observable, but its formation is evidenced by the labels, titles, or verbalizations which a teacher attaches to a particular content unit. Percept is an explanatory construct which refers to a hypothesized process mediating between apprehension of a content unit and some observable response to that unit. This construct has only restricted use; its primary function is to highlight certain problems of data interpretation.

Procedural Problems Implied by Percept Formation

The definition of percept implies that the teacher must be given the opportunity to form the meaning of a content unit in terms of his own views regarding facilitating learning. This should allow the teacher to differentiate the figure and ground characteristics of the content unit according to his own perceptions. Therefore, the procedures needed for data collection must provide opportunity for a teacher to read the content unit, to differentiate the meaning of the described behavior or event, and to manifest his percept in an observable, recordable manner. Consider Content Unit B.[1]

> Content Unit B
>
> A teacher relates that he has children write experiments in a notebook, listing materials, what they did with them, and describe what else could be used in an experiment.

It is possible that a teacher might differentiate several percepts for this content unit. He might also formulate several ways of labeling, or verbally tagging, the teaching practice described. As examples, three possible percept labels are:

Percept B_1: Involves students in the organization of written material,

Percept B_2: Fosters pupil initiative, or

Percept B_3: Provides students with independent work.

A schematic representation of multiple percept formation may be found in Figure 1.2.

The possibility of multiple percept formulation presented an important methodological problem. The researchers realized that it was unlikely that a teacher would find it meaningful to differentiate only a single specific percept from a content unit. But it did seem possible that a teacher might perceive the

[1] All Content Units in this chapter and throughout the document have been taken verbatim from experimental materials derived by teachers through a process described elsewhere.

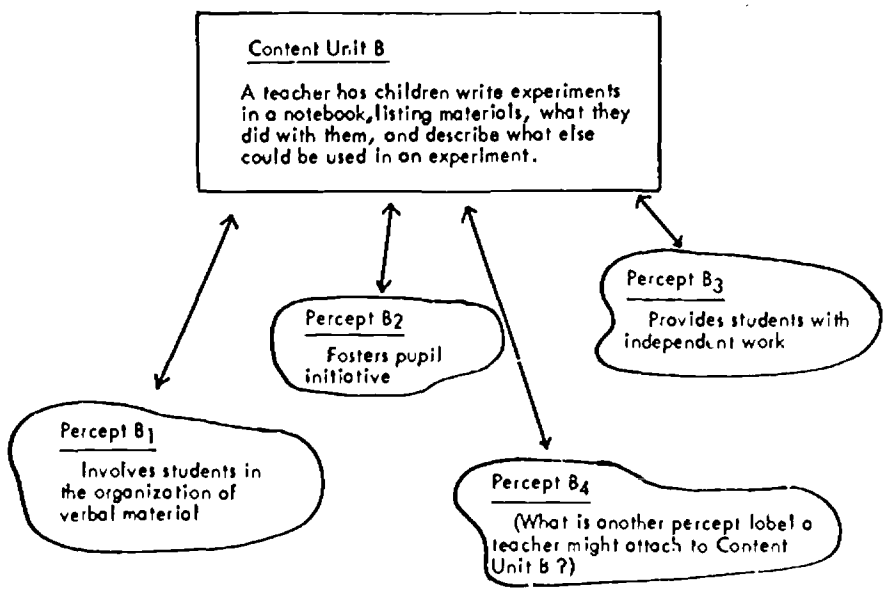


Figure 1.2 Schematic representation of multiple percept formation.

content unit as an entity having a single unity of meaning with several very specific sub-characteristics. To solve this methodological problem, a teacher would have to be instructed to consider the molar qualities of the content unit rather than its molecular characteristics.

A second important methodological problem is that several teachers might be expected to perceive different meanings of a content unit. A teacher from a one-room rural school might perceive a meaning in a content unit which is different from that perceived by a sixth-grade teacher in a city school. This reality was a crucial factor in research operations. An important substantive question was: Is there any commonality or similarity among the percepts of several teachers with respect to a single content unit?

c. STRUCTURE OF A TEACHER'S VIEWS

The structure of a teacher's views refers to the organization of the substance of his perceptions. Perceptual discrimination is the basic process by which a teacher organizes substantive material. The discrimination process will be defined in the discussion below in terms of a teacher's perception of content units. Following this, consideration will be given to the methodological conditions needed for observing the structure of a teacher's views.

Definition of Discrimination

Discrimination refers to the psychological process by which a teacher perceives differences or similarities among content units.[1] It is the process of "reacting differently to different objects" (English and English, 1958). The result of a teacher's discriminations may be displayed by the way he combines or separates several content units. Under appropriate experimental conditions, when a teacher groups together certain content units he manifests that he has detected certain dominant perceptual similarities among the individual content units in the group he creates. When a teacher separates or does not group certain content units, it may be assumed that he has detected meaningful substantive differences among the units. In this study, each teacher was asked to form groups of content units in accord with his views of facilitating learning.

[1] For discussions of perceptual discrimination, see J. S. Bruner, Jacqueline Goodnow, and G. A. Austin, A Study of Thinking, 1956; or W. R. Garner, American Psychologist, 1966.

Consider these content units:

Content Unit B

A teacher has children write experiments in a notebook, listing materials, what they did with them, and describe what else could be used in an experiment.

Content Unit C

A teacher states that his fifth graders have had difficulty in putting a story in logical sequence. He has had to repeat and review in order for them to do it correctly. He feels that their learning to outline has helped in this skill.

Content Unit D

A teacher would teach descriptive words to her third graders by having them write an animal's name, and write sentences about that animal using the descriptive words.

Content Unit E

A third-grade teacher stresses paragraph writing in all subjects so they are very conscious of what makes a paragraph. She tells the pupils that it would not be an honor roll paper unless it is correctly done.

The research objective was to observe the similarities and differences which a teacher might detect among content units. As a result of perceptual discrimination, a teacher might physically group or separate the units into several categories. In the case of these four statements, he might group together Unit B and Unit C and separate Unit D and Unit E. His reasons for doing this might have been that he perceived Unit B and Unit C as concerning the "Involvement of students in the organization of written material;" while Unit D was perceived as "Teaching the structure of language;" and Unit E remained separate because he perceived it as "Encouraging students to improve their work." A schematic representation of this sorting of these four units is displayed in Figure 1.3. This representation is presented as a hypothetical reflection of structure of a teacher's perceptions of the four units, based on his views of the facilitation of learning.

Methodological Problems of Sorting Content Units

The operational procedures inferred from this example and the definition of discrimination formed the basis for data collection methods used in the investigation of the structure of a teacher's views. The primary requirement of experimental conditions was that a teacher be allowed freedom in sorting a set of content units into categories. Also, the experimental conditions had to be standardized so that systematic recording of a teacher's categorizations would be possible, and so that two or more teachers could perform the sorting operations according to a uniform set of directions.

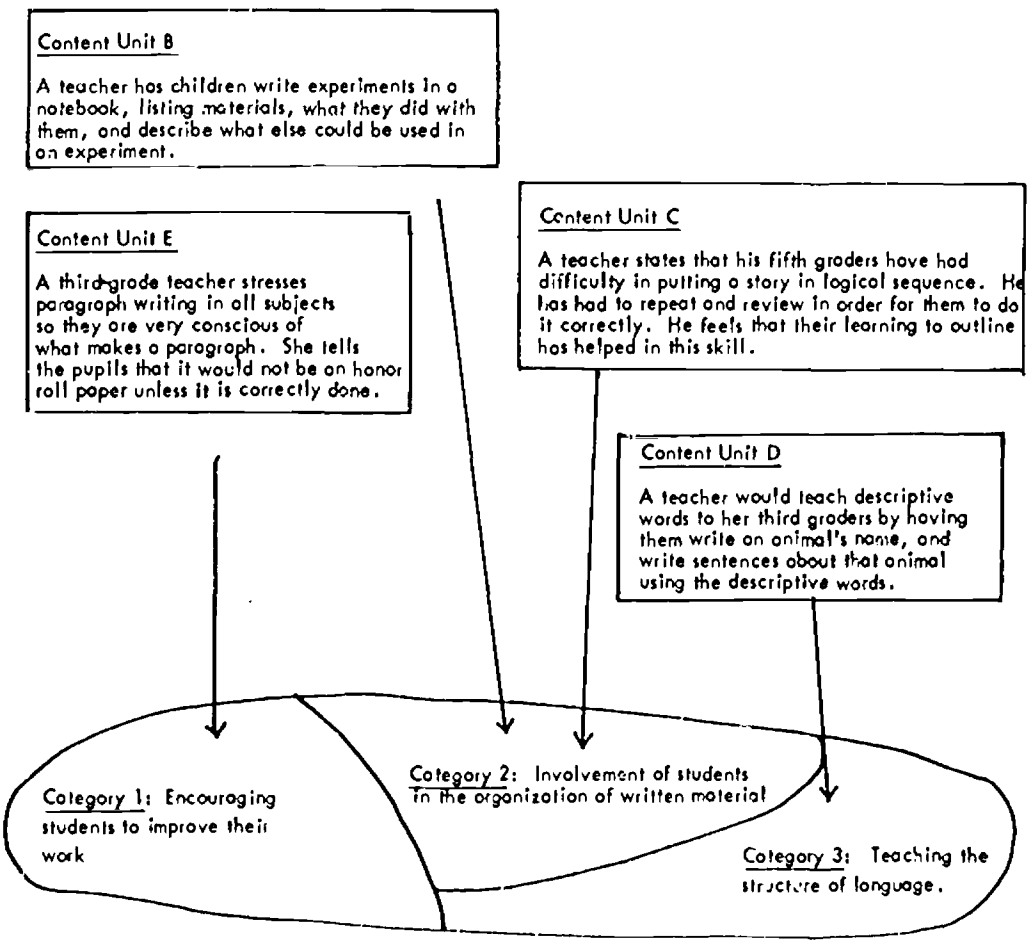


Figure 1.3 Schematic representation of a hypothetical sorting of four content units.

Two major problems attended the formulation of these conditions. One problem was that a teacher might perceive several ways of grouping and separating a set of content units. A teacher would often respond to such an ambiguous situation by saying, "Well, it depends on the situation, the grade level the time of year, or the kinds of students being taught." Through appropriate arrangements of experimental conditions, it was possible for a teacher to display a single arrangement of the content units which he perceived to be most meaningful.

The second problem is related to the variety of ways in which several teachers might sort the same set of content units. Teachers are different; each teacher behaves as an individual, and one teacher's response to a situation is different from the responses of other teachers. The validity of this research depended upon the condition that each teacher be provided complete autonomy in the grouping of content units according to his perceptions. Even though each teacher might manifest his uniqueness of perception and discrimination through displaying individuality in sorting, an important hypothesis was that there would be reliable similarities in structure among several independent arrangements of the same set of content units. The analytic techniques formulated for investigating this hypothesis involved mathematical procedures which enabled the sorting arrangements of several teachers to be compared for identifying underlying commonalities.

d. PARADIGM OF RESEARCH PROCEDURES

The attainment of the central research objective of this project, the description of the substance and structure of a teacher's views regarding the facilitation of learning, coupled with the nature of this substance and structure and with the methodological requirements considered above, suggested a three-stage research procedure:

1. Production of content units,
2. Formation of percepts, and
3. Discrimination among content units on the bases of percept formation.

These stages are represented in Figure 1.4, and a summary of each stage is presented on the following page.

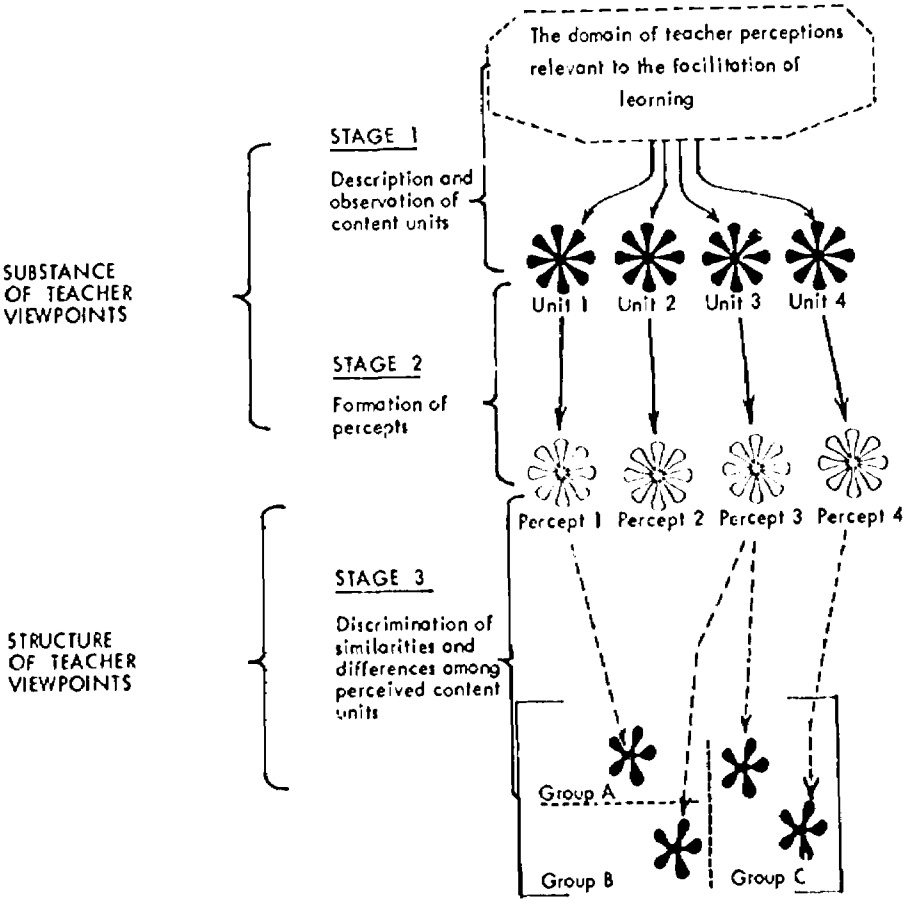


Figure 1.4 Paradigm of the stages of research procedures.

Stage One: Production of Content Units. The first stage involved observing and recording a teacher's descriptions of classroom-relevant behaviors and events. The specific procedures for accomplishing this had to allow a teacher freedom to select the kinds of behaviors and events to be described, freedom to form the manner of description, and freedom to express the relevance of a behavior or event for facilitating learning. However, the techniques of numerical analysis necessitated a basic standardization of the procedures for producing content units. The outcome of this stage would be production of a relatively standardized set of content units.

Stage Two: Formation of Percepts. The second stage involved establishing conditions which would allow a teacher to form a percept for each content unit according to his own cognitions about facilitating learning. The procedures required the teacher to attach to each content unit a single dominant unity of meaning. The prime goal of this stage was to allow the teacher to form a clear percept of each content unit, manipulation of a set of content units could then be meaningful and efficient.

Stage Three: Discrimination of Content Units. The third stage involved the provision of conditions under which a teacher could manifest the similarities and differences he discriminated among a set of content units by sorting them into categories of his own specification. Other procedural conditions were 1) that the groupingof the statements could be systematically recorded, and 2) that two or more teachers could perform the sorting operations according to a uniform set of instructions. The outcome of this stage would be the manifestation of the interrelationships of a set of content units. The interrelationships, manifested in this way, would represent the teacher's views regarding the facilitation of learning.

This paradigm is a simplified portrayal of the sequence of data collection operations. An overview of the actual operational procedures will be presented in the next section.

e. OVERVIEW OF PROCEDURES

Discussion in previous sections has described the theoretical background of the procedures which were employed for investigating the substance and structure of a teacher's views. The discussion was intentionally phrased in terms of a single teacher. However, the research objective was not merely to investigate the views of some particular teacher. Rather, the objective, as stated at the beginning of the chapter, was to investigate the substance and structure of a collectivity of elementary teachers' views con-

concerning the facilitation of learning. It is the function of this section to indicate how the theoretical formulations presented above were translated into a systematic set of procedures used to study the substance and structure of teachers' views. The major areas of discussion will be 1) the production of content units, 2) the observation of the structure of a single teacher's manifestation of his percepts of a group of content units, and 3) the explication of the analytic procedure used to display the structural similarities among the manifested perceptions of several teachers.

Production of Content Units

The procedures used for producing content units were 1) a free-response, tape-recorded interview which focused on elementary classroom behaviors and events, and 2) a specially derived set of content analysis procedures for reducing recorded interviews to sets of content units.

Focused, free-response interviews. The method chosen for collecting descriptions from a teacher was a focused, free-response interview. This type of interview allows a teacher "to build a picture around one or more points of orientation by the interviewer... it does not explicitly define boundaries for the informant. He is expected, moreover, to maintain contact with the central focus or foci of the interview " (Richardson, et al. 1964).

The general interview procedure was to explain to a teacher the nature of the project and the kinds of questions and discussion the interview would involve. For example, it was carefully explained to each teacher that the intent of the interviewing was to collect the teacher's own ideas, that there was no concern with any evaluation or judgment of his competence or ability as a teacher. It was explained that the specific response to any question depended solely on how the teacher wished to respond, that he could respond in any way he desired, but that he would be asked to give examples of behavior or events mentioned in terms of his own experiences.

Each tape-recorded interview lasted approximately two and one-half hours. The interview was conducted by two people: one of the interviewers was an experienced elementary teacher, and the other was an educational psychologist who also had some teaching experience. The reason for this "tandem" interview was that interviewees often used a "classroom vernacular" not always understandable by those with limited teaching experience. It was believed that the presence of another teacher in the interview situation would facilitate communication, explication, and acceptance of project goals. To further

facilitate the administration of the interview, the project provided funds for employing a substitute teacher by the school district. Thus, a teacher was freed of classroom duties to be interviewed without interruption.

Four interview schedules were constructed to provide a balanced coverage of a broad range of discussion areas. The four schedules covered four general topics: organization of a typical school day, subject-matter instruction, long-range instructional goals, and teaching and learning problems. The kinds of questions asked may be illustrated with reference to Schedule 1, Organization of a Typical School Day:

"Do you have a particular way of beginning each day?"

"Would you give the sequence of your activities this morning?"

"In what way do pupils take part in planning?"

"Do you have a particular way of ending each day?"

Throughout the interviews, the interviewers would ask general questions at appropriate times:

"Can you give an example?"

"Would you describe in more detail?"

"Could you describe why you did that?"

"What happened after that?"

"What did you do?"

These and similar types of questions were used to permit the interviewee to elaborate in depth in terms of his own efforts to facilitate learning.

The result of an interview was a tape-recording of a teacher's responses to interview questions and his elaborations of classroom-relevant behaviors and events which he had experienced. A major advantage of such a free-response interview schedule is that it allows the informant discretion in reflecting his experiences. A disadvantage is the difficulty of transforming the recorded material into a form which is relatively easy to analyze, and which nevertheless retains the qualities of the interviewee's idiosyncratic expression. The retention of these idiosyncratic qualities was, of course, a paramount concern. The ultimate objective of interviewing was to produce a source of content data which would appropriately represent the teacher's views.

Summarization of the recorded interview. It was necessary to develop a technique for summarizing the recorded interview material. One procedure which was considered was to interview a teacher in the morning and to have that same teacher summarize the interview into content units by listening to the recording during the afternoon. This procedure would have involved a number of practical difficulties, so each recording was summarized by other teachers who were employed for this purpose. The teachers so employed were first trained, so that relatively uniform summaries would be obtained. The standardized summarization procedures were designed to allow the interviewees' expressions to be maintained. The interview summarization was conducted in two steps, designated as "Judging" and "Blocking."

Judging. In judging, a teacher listened to a tape-recording; as he listened, he transferred onto a special report form those statements which he considered to contain a single, meaningful thought about facilitating learning. Whenever possible, the exact words of the interviewee were transcribed. Two teacher-judges made summaries of each recording 1) to ensure that all the interviewee's statements were obtained in the desired form, and 2) to provide a reliability check on the transcription process. The outcome of judging was the production of two sets of content units for each tape-recorded interview.

Blocking. The two judges submitted their independent transcriptions of each interview to a blocker who combined them into one set of content units for each interviewed teacher. To do this, the blocker (a teacher) listened to the original tape-recording of the interview while simultaneously studying the corresponding Judging reports. When the blocker noted redundancy between the content units of the two judges, he recorded both units. If the blocker felt that a meaningful statement of a teacher had not been reported by either judge, he would add a report of that statement to his summary. In training the blockers, it was emphasized that they should be very careful to preserve the subtleties and nuances of the interviewees' expressions.

The result of blocking was one series of content units derived from a tape-recorded interview. An exemplary set of content units is given in Table 1.3. The content units produced according to these procedures provided the material needed for investigating the structure of teachers' perceptions of facilitating learning.

TABLE 1.3

EXEMPLARY SET OF CONTENT UNITS SUMMARIZED FROM A TAPE-RECORDED INTERVIEW

A.	A primary teacher has students practice spelling words and writing on the board.
B.	A teacher feels that even if it is old-fashioned, she believes in giving review of the multiplication tables every week because pupils like it and can see themselves improve.
C.	A teacher has a couple of boys in her room who are having difficulty in reading. She feels that their difficulty is a lack of vocabulary which prevents good comprehension. She feels they didn't have enough individual help in lower grades.
D.	A teacher says that memorization comes faster after they picture the facts with objects.
E.	A third-and fourth-grade teacher is in close contact with the fifth an ..xth grade teacher for science. They discuss what they teach in order to get good integration between the grade levels.
F.	A teacher, in desperation of teaching the difference between the b and d, told the class that the b comes first in the alphabet so that the line comes in front. She feels that each problem is an individual problem and she needs to try all method. for mastery.
G.	A teacher tells the class that a diagram of a sentence is to grammar what a map is to a road system.
H.	A teacher says you can have a lot of problems in second-grade arithmetic if the pupils haven't had the first grade arithmetic according to the new arithmetic methods. The first-grade arithmetic in the new program goes farther than conventional methods, and the pupil who starts it new in the second grade will be behind.
I.	A teacher just f..llows the spelling workbook.
J.	A teacher states that she takes those who just can't get along without disturbing others with her, if she must leave the room.
K.	A teacher had difficulty with her fifth graders in understanding the difference between elements and compounds. They confused natural resources with elements. She used chemistry charts with abbreviations to show how elements compared to natural resources and through experiments they finally seemed to understand.

Sorting Procedures

Earlier discussion indicated that the structure of a teacher's perceptions could be studied by establishing experimental conditions under which a teacher would group or separate content units according to his views of facilitating learning. The nature of the appropriate conditions was described as a process through which a teacher could sort a set of content units into categories of his own specification.

Materials and methods of sorting. The basic materials for the sorting procedure were 1) a set of content units, each contained on a single slip of paper, 2) a sorting board to which was attached a set of 5 x 8 file cards which were folded so that each card formed a pocket into which content units could be placed, and 3) a standardized set of instructions according to which a sorter grouped and separated content units. The set of content units was arranged in an independent random order for each sorter and was placed in a series of envelopes, with about twenty-six slips in each envelope.

The sorting task was administered to teachers who were trained for the task, either individually or in groups, depending on practical circumstances. The training involved explanation of the intention and purposes of the research, study of the instructions, illustration of the sorting procedure by a researcher, and discussion of the sorting procedure. The illustrations and explanations in the training procedure involved little if any actual reference to content units concerned with classroom teaching and learning. For example, the sorting procedure was illustrated with specially constructed content units concerning the behavior of store clerks. Whenever possible, questions by the teacher-sorters were answered with reference to the exemplary content units describing store clerks' behaviors. The central aim of the training was to acquaint the trainees with the sorting procedures. They then proceeded to group and separate the classroom-relevant content units according to their own perceptions.

The sorting task consisted of putting together any two or more content units which the teacher perceived as concerning the same aspect of facilitating learning. It was emphasized to the sorter that he was to put together those units which he considered similar and to keep separate those units he considered different. A brief summary of the steps of the sorting procedure is given in Table 1.4. For the reader who wishes to try this sorting procedure, a Demonstration Kit is contained in the pocket of the back cover. A photograph of a teacher engaged in sorting is presented in Figure 1.5.

TABLE 1.4

SUMMARY OF THE STEPS OF THE SORTING PROCEDURE

To form groups of content units, teachers carried out the following directions, one step at a time.

First: Read and study the first statement in the envelope.

Second: Decide what aspect of facilitating learning the statement concerns.

Third: Write a tentative statement of this idea on the first holder.

Fourth: File the statement inside the holder.

Fifth: Repeat steps 1 – 4 for each statement. If any new statement concerns the same aspect of facilitating learning as one which you have previously sorted, put the two together. If not, begin a new group by writing a new tentative title on another holder and placing the statement inside.

Sixth: Resorting: At any time during the sorting task you may come across a statement which does not belong where you have previously placed it. You may do one of three things with it

a. Place it in another group,

b. Start a new group, or

c. Mix it with the other statements not yet sorted.

Seventh: Review your groupings carefully. Review the ideas of each grouping with special concern for whether the statements belong together. You may make any changes by dividing, combining, or switching the statements.

Finally: Check to see that you have written a word or short phrase on each holder used which you think best describes the central idea which caused you to place the statements together.

Figure 1.5 A teacher performs the sorting task.

Outcome of the sorting procedure. It may be noted by reference to Table 1.4 or to the Demonstration Kit that the sorting task involves a series of steps which provides the opportunity to form a percept of each content unit and then to make substantive discriminations among content units. In practice, these perceptual processes probably occur simultaneously. The instructions indicated that a sorter should read and study a content unit, should decide what aspect of facilitating learning the unit concerned, and should write a tentative statement of his idea on a sorting pocket in which he should then place that content unit. The first two steps provided the opportunity for a sorter to form a percept of the content unit, and in the third step he recorded his label for the percept. Other steps of the sorting procedure enabled the sorter to discriminate similarities and differences among the units and to ascribe labels to those discriminations.

Thus, completion of the sorting task by a teacher resulted in dividing the set of content units into several smaller groups of units. With respect to content, each of these groups is a relatively homogeneous category, and the percepts which correspond to the items in a category are considered to overlap extensively. That is, a partitioned set of content units manifests the differentiated structure of a sorter's percepts regarding the facilitation of learning.

A set of content units which has been sorted by a teacher is called a manifest partition of the set, and a teacher's individual sub-sets of units are called manifest categories. The labels which teachers provided for their manifest categories were written on the pockets of the sorting board. Figure 1.6 illustrates the manifest categories of one sorter.

It is important to note that the sorting procedure imposed few restrictions on a sorter's construction of his manifest partition. Indeed, the only restrictions were those requiring that he follow the sequence given in the instructions, that he write down his ideas, and that he use the sorting board for arranging the content units. He was not asked to construct his categories in particular ways, or to establish a particular number of categories, or to place a minimum or maximum number of units in any group. A category could consist of one content unit or of any number of units. However, each content unit had to be placed in one and only one category.

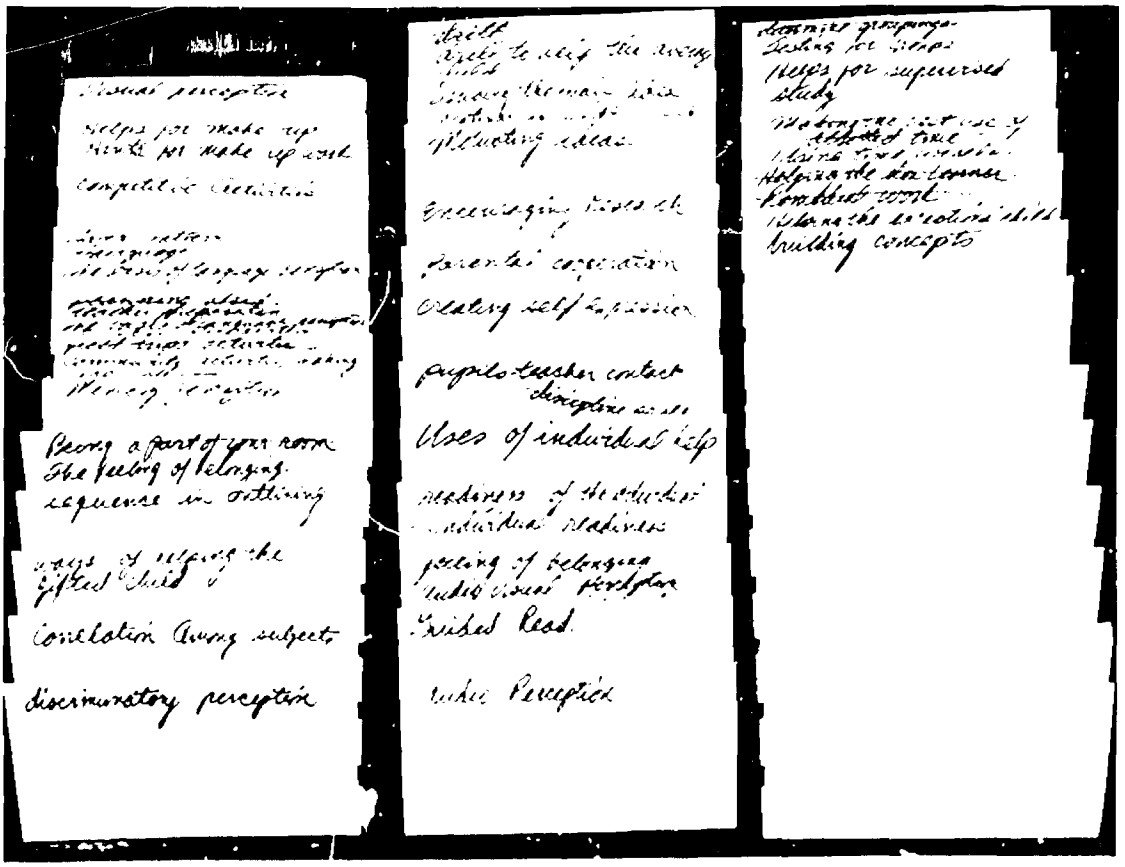


Figure 1.6 One teacher's manifest partition of a set of content units.

Analyzing for Latent Structure

The sorting procedure outlined here provided a method for observing the structure of a single teacher's perceptions of a particular set of content units. When several teachers sorted the same set of content units, the result was several different manifest partitions. Comparison of the categories constructed by one teacher with those constructed by another teacher revealed that many content units had been grouped in similar ways by both teachers. It was a central objective of the project to investigate the character of these common categorizations.

If several teachers form identical or similar content unit groups, a category is defined which reflects their common perceptions, or their common discriminations. Such a category is termed a latent category and is empirically defined by a set of content units grouped in the same way by several sorters. Further, when several groups of content units are commonly discriminated by several sorters, the result is a set of latent categories. The techniques which were used for identifying empirically a set of latent categories on the basis of several independent sets of manifest partitions are discussed in the following paragraphs. First, the technique for summarizing several manifest categorizations will be described, and second, brief mention will be made of the method developed for identifying a set of latent categories.

Summarizing several manifest partitions. A convenient and useful way of summarizing a sorter's set of manifest categories is to construct a contingency table, or a contingency matrix. This matrix is constructed by recording whether or not a sorter did or did not put any two particular content units together in the same group. For example, if a sorting task consisted of four content units, a sorter might group two of the units together and isolate the other two:

Category 1, Unit A and Unit C,

Category 2, Unit B, and

Category 3, Unit D.

This manifest partition is recorded in the following matrix, where a "1" indicates that two given units were combined, and a "0" indicates that the two units were not combined.

	Content Units			
	A	B	C	D
A	1	0	1	0
B	0	1	0	0
C	1	0	1	0
D	0	0	0	1

This method of recording a set of manifest categories may also be used for summarizing the manifest partitions constructed by several sorters. For example, assume that a sorting task consisted of four content units, and that each of three sorters grouped the units in exactly the same ways:

Category 1, Unit A and Unit B,

Category 2, Unit C, and

Category 3, Unit D.

These three sets of manifest categories would be individually recorded by entering a "0" or a "1" in the matrix for each pair of items; the resulting entries in each position in the matrix would then be summed. The completed matrix would have the same number of rows and columns as the matrix of "1's" and "0's" for an individual, but the entries in positions on the diagonal would all be equal to the number of sorters--in this case, 3:

	Content Units			
	A	B	C	D
A	3	3	0	0
B	3	3	0	0
C	0	0	3	0
D	0	0	0	3

The usefulness of this method for combining the manifest partitions of several sorters is a function of the facility which it provides for summarizing commonalities of sorting. That is, it allows observation of the latent category structure. However, a major computational problem arises when variations occur among the manifest partitions of several sorters, or when the number of sorted content units is increased. This problem is unavoidable, because 1) there are bound to be individual differences among several independent manifest partitions in actual sorting experiments, and 2) any serious investigation of the substance and

structure of teachers' views must be based on a relatively large number of content units.

Solving this problem required the development of complex mathematical and computational techniques for analyzing contingency matrices. An outline of these analytic methods and an example of their results will conclude this section.

Latent structure of several manifest partitions. When several manifest partitions are compared, it is apparent that many similar manifest categories have been formed by some of the sorters. It has been stated that independent but similar groups of content units provide the basis for the concept of a latent category. If several independent sets of content units are sorted similarly, it would seem possible to identify a set of latent categories, or a latent partition, which would characterize the structure of the manifest partitions of several sorters.

Consider, for example, an experiment in which each of eight teachers has sorted the same six content units. A summary tabulation of these manifest categorizations might produce the following matrix:

	Content Units					
	A	B	C	D	E	F
A	8	0	8	3	0	8
B	0	8	1	8	7	1
C	8	1	8	0	0	7
D	3	8	0	8	7	0
E	0	7	0	7	8	0
F	8	1	7	0	0	8

The structure of this matrix suggests that there may be some systematic organization or pattern common to the independent manifest partitions of the eight sorters. However, it is difficult to identify the common systematic pattern, or the latent structure, simply by observing the matrix. One technique for assisting the identification is to rearrange, or permute, the tabulated frequencies so that the rows and columns which seem to be most highly interrelated are situated next to one another. A rearrangement of this kind is given in the following matrix:

	Content Units					
	A	C	F	B	D	E
A	8	8	8	0	3	0
C	8	8	7	1	0	0
F	8	7	8	1	0	0
B	0	1	1	8	8	7
D	3	0	0	8	8	7
E	0	0	0	7	7	8

The result of this rearrangement is a more structured summary of the frequency tabulations. It is now much clearer that Units A, C, and F are interrelated, that Units B, D, and E are highly interrelated, and that very little relationship exists between one group (A, C, F) and the other group (B, D, E).

In summary, rearranging the rows and columns of the contingency matrix has facilitated the identification of two latent categories of content units. These latent categories are based on commonalities among groups of units contained in the sorters' manifest partitions.

To illustrate the substantive meaning of derived latent categories, the following six content units are given:

A. This primary teacher has students practice spelling words and writing on the board.

B. This teacher tries to lead second graders, by the end of the year, to find out more information on their own from dictionaries and encyclopedias instead of depending entirely on her telling them.

C. This teacher would give children having difficulty in spelling more writing activities, such as using the spelling words in a story.

D. This teacher states that students can be made aware of directions by having them read for themselves; then, if they have questions she will help them.

E. This third-and fourth-grade teacher has her children work individually at their seats on their map skill books while she circulates around the room helping them. The work is corrected by each child as the teacher reads the answers.

F. This teacher says she doesn't require looking up the meaning of words in spelling class unless no one knows the meaning, or can use it in a sentence. It slows up the whole class and they might as well learn from each other as from the dictionary.

These content units were used in a sorting experiment involving thirty-two teachers. The summary tabulations of the frequencies of content unit combinations are given in the following matrix, which is presented in its rearranged form:

	Content Units					
	A	C	F	B	D	E
A	33	9	4	0	1	0
B	,	33	4	1	1	2
F	4	4	33	3	3	2
C	0	1	3	33	12	4
D	1	1	3	12	33	4
E	0	2	2	4	4	33

Study of this matrix suggests that two latent categories could be derived which would reflect the sorters' common perceptions of the content units. The two latent categories which were mathematically derived for these content units are presented in Table 1.5. This example illustrates the techniques for identifying the latent structure which is hypothesized to underlie the manifest categorizations of several sorters. The quantitative methods for determining latent structure are complex and are discussed in Chapter 7 and in Appendix G.

TABLE 1.5

EXAMPLES OF LATENT CATEGORIES

Latent Category 12: Spelling

A. This primary teacher has students practice spelling words and writing on the board.

C. This teacher would give children having difficulty in spelling more writing activities, such as using the spelling words in a story.

F. This teacher says she doesn't require looking up the meaning of words in spelling class unless no one knows the meaning, or can use it in a sentence. It slows up the whole class and they might as well learn from each other as from the dictionary.

Latent Category 19: Pupil Initiative

B. This teacher tries to lead second graders, by the end of the year, to find out more information on their own from dictionaries and encyclopedias instead of depending entirely on her telling them.

D. This teacher states that students can be made aware of directions by having to read them for themselves; then, if they have questions she will help them.

E. This third-and fourth-grade teacher has her children work individually at their seats on their map skill books while she circulates around the room helping them. The work is corrected by each child as the teacher reads the answers.

CHAPTER 2

A RESEARCH TRIPTYCH

The study of teacher viewpoints of classroom teaching and learning, like most long-term research projects, was actually a series of smaller interrelated investigations. The exploratory and developmental features of the study were important influences on the evolution of these smaller and relatively discrete investigations.

Early in the study it was recognized that the development of specialized methods would be an enduring necessity. Consequently, great amounts of time and project resources were devoted to deriving and testing research methods. Many of the project's discrete events, then, were related to methodology. Other events were related more to the application of methods than to their derivations; a newly developed methodology could have been applied to test it or, after it had been tested and refined, to gather data to be analyzed and used for substantive inference.

A typical and difficult research problem often appears unexpectedly in exploratory studies. Occasionally these unanticipated problems are so important that there is no progress until they are solved. Two such problems developed during the course of the study of teachers' views. One of these was the problem of drawing representative samples of teachers from a complex statewide educational network; the other was the problem of measuring the essentially qualitative substance and structure of viewpoints.

Because the study of teacher viewpoints was exploratory, and because some of the major undertakings were unforeseen, the particular discrete activities which comprised the eventual operational definition of the project were not known before their occurrences, and their interdependencies and implications were frequently not known until sometime after their occurrences. Consequently, the interrelationships of project events can be succinctly described in retrospect, whereas they could not possibly have been predicted in advance. Each event, each developmental or procedural undertaking, was contingent on the results of prior events and was predicated on the sum of the knowledge accumulated during all earlier project activities.

The remaining 13 chapters of this document are organized to provide a detailed perspective of the project events, exhaustive descriptions of the methodologies which were developed and the motivations for developing them, and comprehensive results of analyses of data produced by the applications of the specialized methodologies. The discussions are complex and technical, and an aid to understanding how

chapter contents relate to one another is desirable.

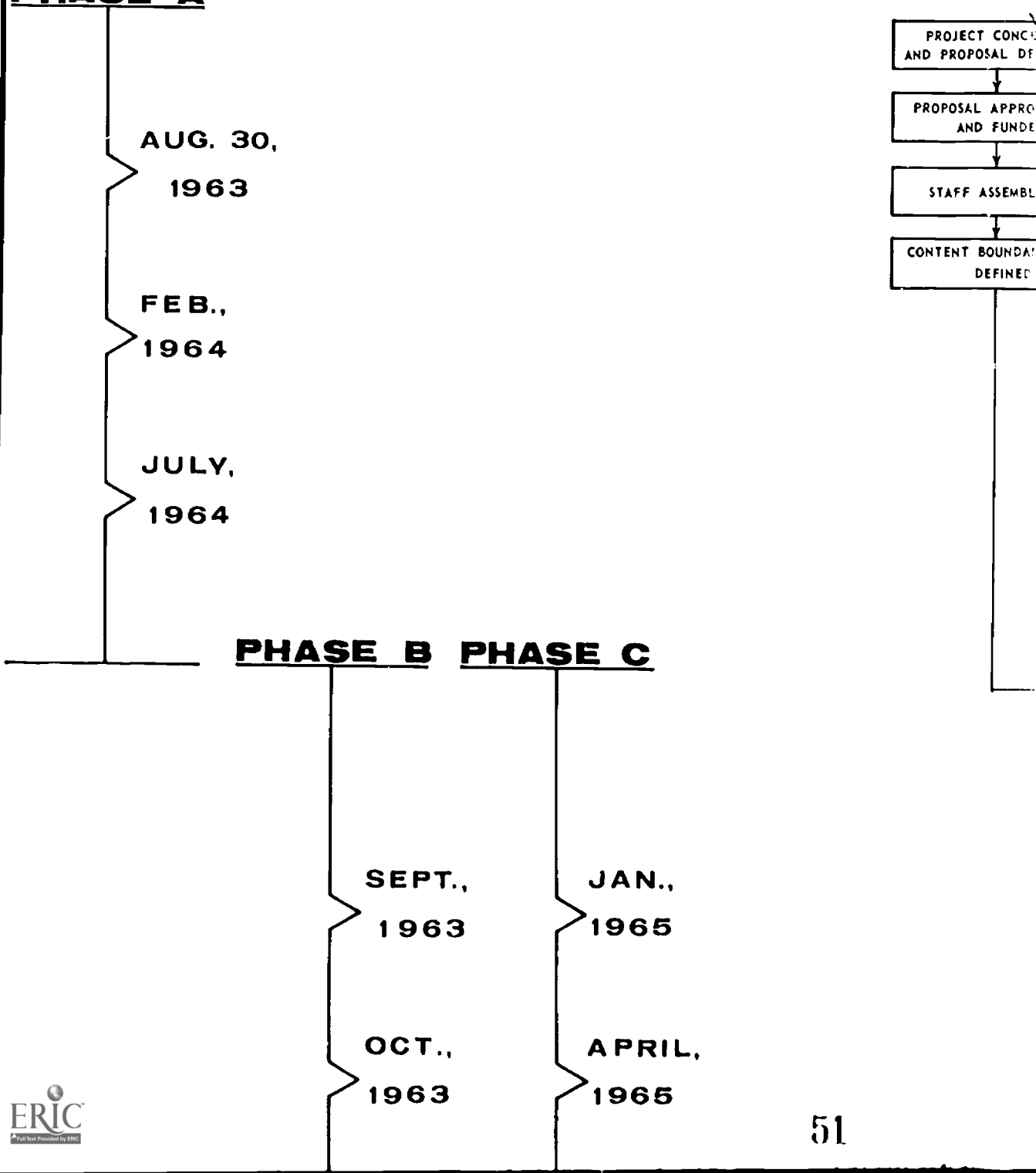
The purpose of this chapter is to provide an overview of the entire study by displaying the major discrete events of the project, by demonstrating the interrelationships among those events, and by tracing the chronological history of the project in terms of its events.

These three aspects of the study are combined in Foldout A, which follows this page. This foldout, the Research Triptych,[1] is a map of the project activities. It folds out to the left of the book and opens upward. In this position, the foldout can be left open for reference purposes without interfering with the examination of the rest of the document. The Triptych is repeatedly referenced in the next 13 chapters; careful study of its contents at this point should facilitate comprehension of the remainder of the report. The dimensions of the Triptych are explained on the pages following the foldout.

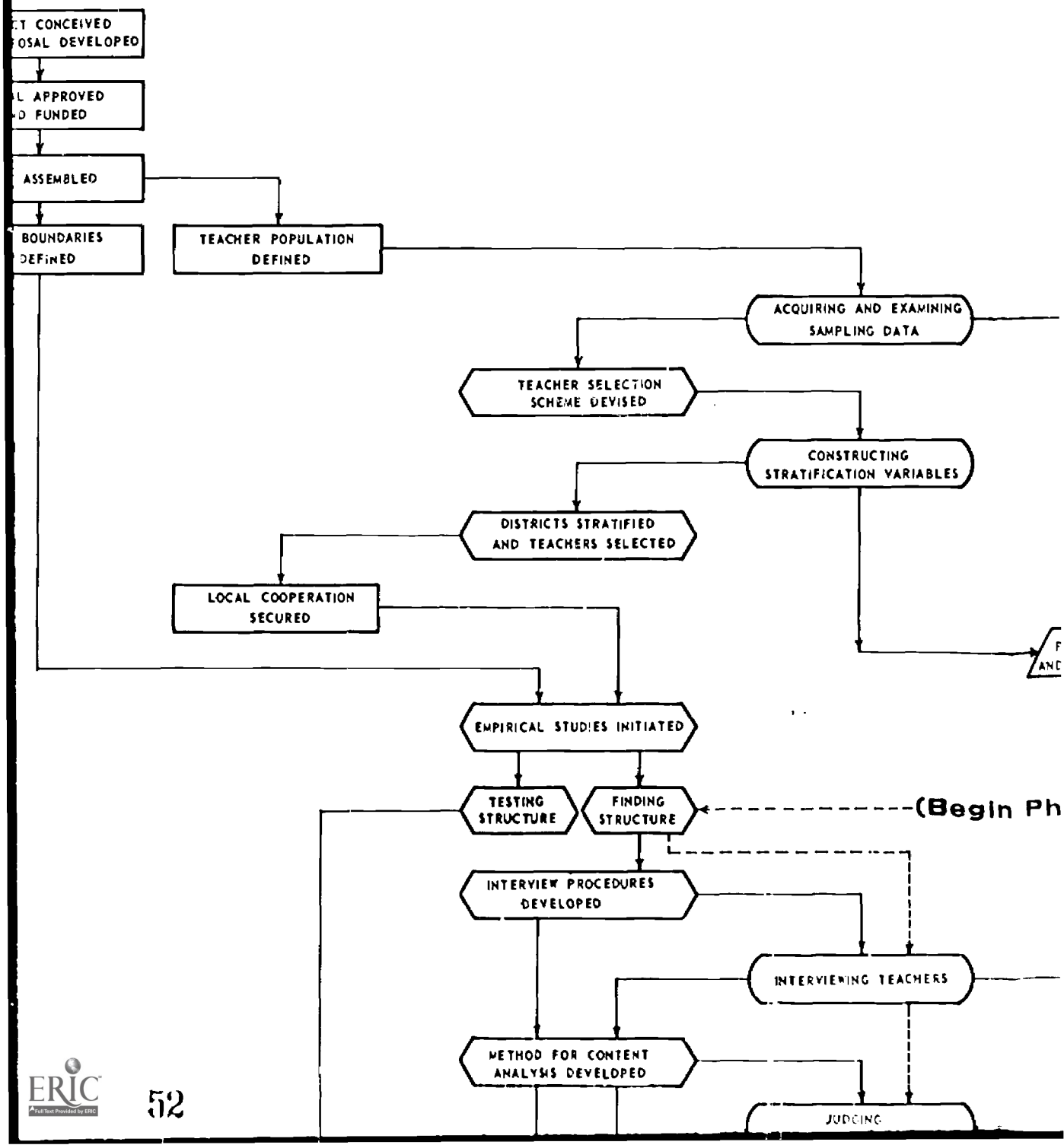
[1] In Webster's Third New International Dictionary, the origin of triptych is identified as Greek, and its meaning is "threefold." It is used to refer to a picture or artwork consisting of a center panel and two flanking panels, where the panels are three matching or contrasting parts of the work.

Foldout A:

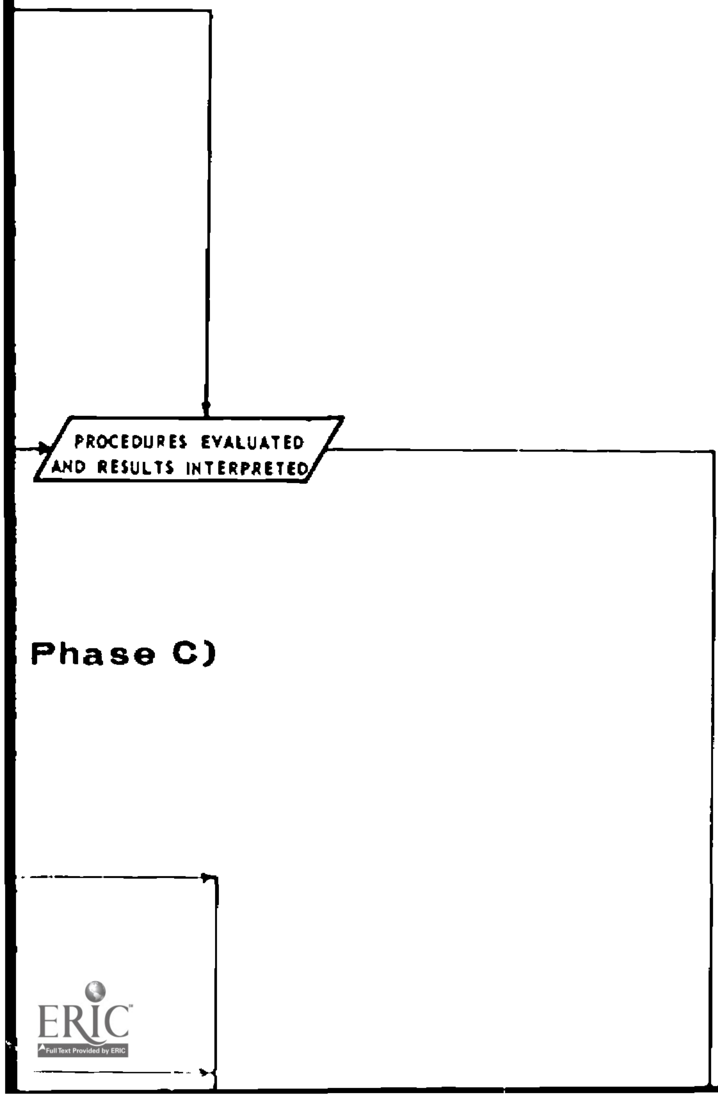
RESEARCH TRIPTYCH


PHASE A
AUG. 30, 1963
FEB., 1964
JULY, 1964
PROJECT CONC
AND PROPOSAL DE
PROPOSAL APPRO
AND FUNDE
STAFF ASSEMBL
CONTENT BOUNDA
DEFINED
PHASE B
PHASE C
SEPT., 1963
OCT., 1963
JAN., 1965
APRIL, 1965

RESEARCH


T CONCEIVED
OSAL DEVELOPED
L APPROVED
D FUNDED
ASSEMBLED
BOUNDARIES
DEFINED
TEACHER POPULATION DEFINED
ACQUIRING AND EXAMINING SAMPLING DATA
TEACHER SELECTION SCHEME DEVISED
CONSTRUCTING STRATIFICATION VARIABLES
DISTRICTS STRATIFIED AND TEACHERS SELECTED
LOCAL COOPERATION SECURED
EMPIRICAL STUDIES INITIATED
TESTING STRUCTURE
FINDING STRUCTURE
(Begin Ph
INTERVIEW PROCEDURES DEVELOPED
INTERVIEWING TEACHERS
METHOD FOR CONTENT ANALYSIS DEVELOPED
JUDGING

TRIPTYCH



ORGANIZING THE STUDY

Project conceived and proposal developed. The pr
process of facilitating learning in an organized framew
teachers. This project was designed to investigate the
and funded. A formal proposal which outlined the domai
of Education. It was approved and funded on August
included specialists in areas of research methodology, ed

REVIEWING PLANS AND SPECIFYING OBJECTI

Before proceeding with methodology development an
It was determined that the target domain of content for th
Throughout the project, procedures were directed towar
the teachers who supplied them. *Teacher population*
State of Wisconsin. For operational purposes, this defin

DEVELOPING A SAMPLING METHODOLOGY

After the content boundaries of the study were det
specified teacher population. *Acquiring and examining*
school districts and teachers in the state. These data
Teacher selection scheme devised. On the basis of samp
The next step, then, was to stratify Wisconsin's elementar
ing stratification variables. Because no single variable
and teacher characteristic variables were derived for ea
selected to be used as stratifying variables. *Districts*
six stratification factors, each at two levels. A factorial
in later samplings. One district was drawn at random
Administrators from the sampled districts were apprised o
solicited from these administrators.

INITIATION OF EMPIRICAL STUDIES

Empirical studies were initiated after the problem
development and data analysis, and occurred in two phas
during Phase C was to systematically apply the refine
Finding structure. There were two distinct types of
structure. Three ancillary techniques were developed
the three instruments.

INTERVIEWING TEACHERS

Focused, free-response interviewing was judged t
procedures developed. Two teachers were interviewed a
interviewing. Schedules were then devised for conduct
maintaining focus on the relevant subject matter.
responses to the interview schedules could be examine
related interviewing variables. In Phase C, a sample of

ANALYZING INTERVIEWS

Method for content analysis developed. Observati
ings into discrete, analyzable units. Again, the chief
accomplished this transformation. *Judgments*
it into a series of discrete statements which describe

THE STUDY

ceived and proposal developed. The project was conceived in order to investigate the general proposition that teachers perceive the day-to-day classroom litating learning in an organized framework. There has been little empirical study of the common features of this perceptual framework, or of its variations among project was designed to investigate the views of teachers – the nature and substance of their perceptions of classroom actions and beliefs. *Proposal approved* formal proposal which outlined the domain of interest, and an approach to the empirical study of the substance of teacher's views, was submitted to the U. S. Office It was approved and funded on August 30, 1963, and the study was begun. *Staff assembled.* For the duration of the 33 months of this study, the research team ists in areas of research methodology, educational field work, and computer technology, as well as experienced teachers and administrators.

PLANS AND SPECIFYING OBJECTIVES

ceeding with methodology development and data procurement, the investigators formulated definitions of the populations to be studied. *Content boundaries defined.* ed that the target domain of content for the study would be the population and organization of teachers' perceptions of the classroom process of facilitating learning. project, procedures were directed toward identifying the substance and organization of these perceptions without imposing external *a priori* perceptual schemes on o supplied them. *Teacher population defined.* The target teacher population was defined as the set of full-time elementary teachers in the public schools of the sin. For operational purposes, this definition was later refined.

A SAMPLING METHODOLOGY

content boundaries of the study were defined, the immediate consideration was to develop an efficient and systematic procedure for sampling teachers from the t population. *Acquiring and examining sampling data.* The Wisconsin State Department of Public Instruction provided comprehensive data on all elementary and teachers in the state. These data were examined, and teachers were identified who were included in the target population as it was operationally defined. *scheme devised.* On the basis of sampling considerations and logistic problems, it was determined that teachers should be sampled at the level of local districts. en, was to stratify Wisconsin's elementary school districts. Participating teachers would then be sampled from districts drawn at random from strata. *Constructed variables.* Because no single variable was satisfactory for stratifying districts, a multivariate procedure was employed. Thirty-one quantitative demographic racteristic variables were derived for each school district and included in an Image Factor Analysis. Six factors of those resulting from the Image Analysis were used as stratifying variables. *Districts stratified and teachers selected.* The distribution of each image factor was dichotomized at the median, which provided factors, each at two levels. A factorial sampling plan was derived that defined 64 strata of school districts. A fraction (32) of these were selected for inclusion ts. One district was drawn at random from each stratum, and teachers were subsequently selected from these sampled districts. *Local cooperation secured.* om the sampled districts were appraised of the research project, and of the fact that their districts had been selected as participants. Continuing cooperation was ese administrators.

F EMPIRICAL STUDIES

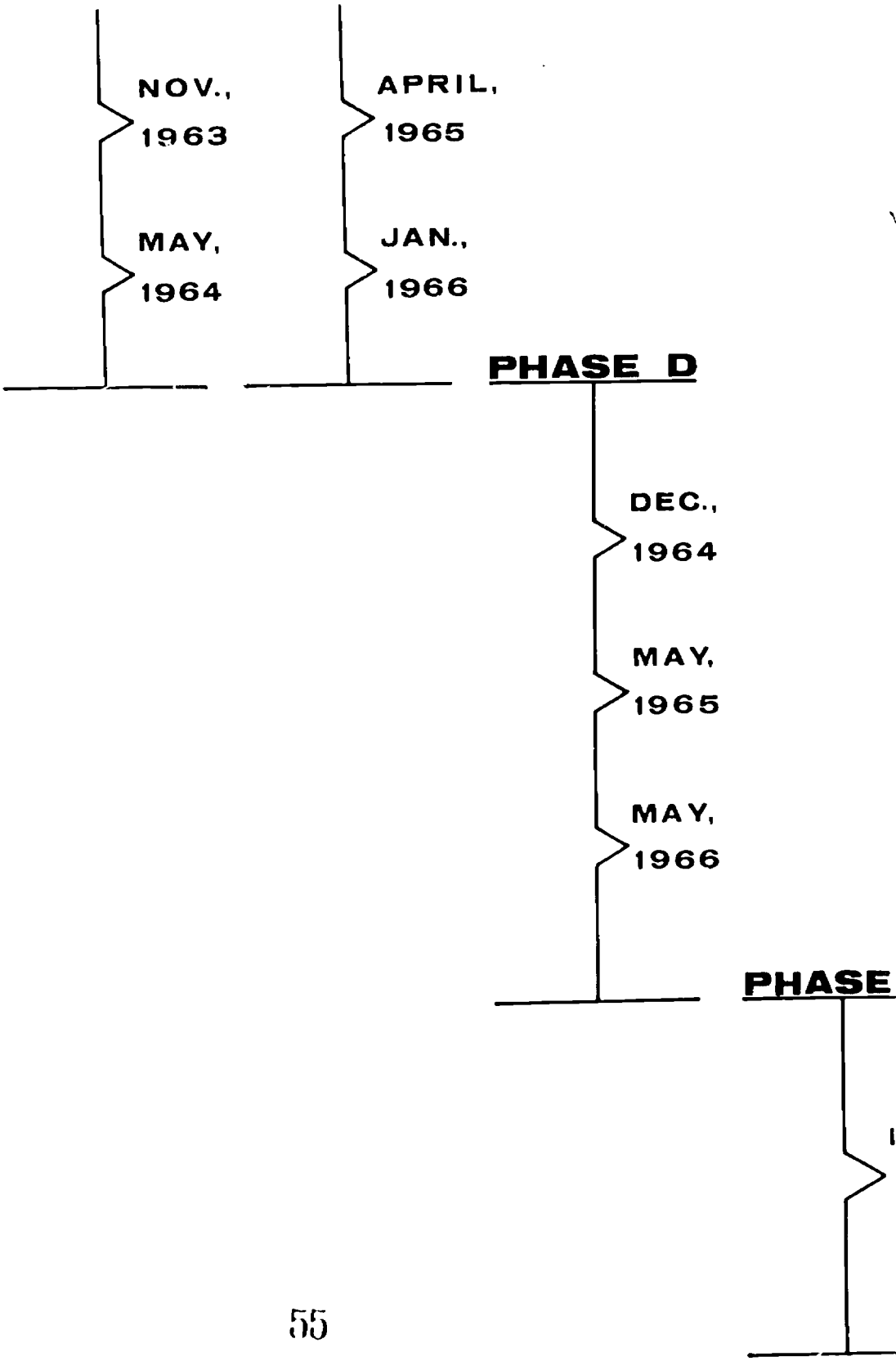
studies were initiated after the problems of staffing, specifying objectives and sampling had been solved. These central investigations involved methodology data analysis, and occurred in two phases. In the first of these, Phase B, the primary concern was developing and pilot testing the methodologies. The concern was to systematically apply the refined procedures to larger samples of teachers. The data and analyses generated during Phase C are presented in this report. There were two distinct types of data collection procedures. The major effort was to find the existing organization of teachers' perceptions. *Testing* e ancillary techniques were developed and implemented in the project. Their purpose was to test teachers' reactions to various perceptual structures built into ments.

G TEACHERS

free-response interviewing was judged to be the best method for sampling the substance of teachers' perceptions without imposing external constraints. *Interview ped.* Two teachers were interviewed at length early in the project to provide information about problems in securing the content of teachers' perceptions through hedules were then devised for conducting a "funneling" interview, which allowed teachers to express their thoughts as openly and fully as they wished while on the relevant subject matter. *Interviewing teachers.* In Phase B, two elementary teachers from each of four districts were interviewed so that teachers' interview schedules could be examined. An additional 25 interviews were conducted during this phase for the purposes of refining the schedules and studying ng variables. In Phase C, a sample of 32 teachers was drawn to be interviewed, and the refined schedules were used in interviewing them.

[illegible]

es developed. Observations of teachers' ideas were then on file in the form of tape recorded interviews, and it was necessary to dissect the recorded units. Again, the objective was to preserve the content and style of the teachers. A two-step manipulation of recorded interviews satisfactorily [illegible]


NOV.,
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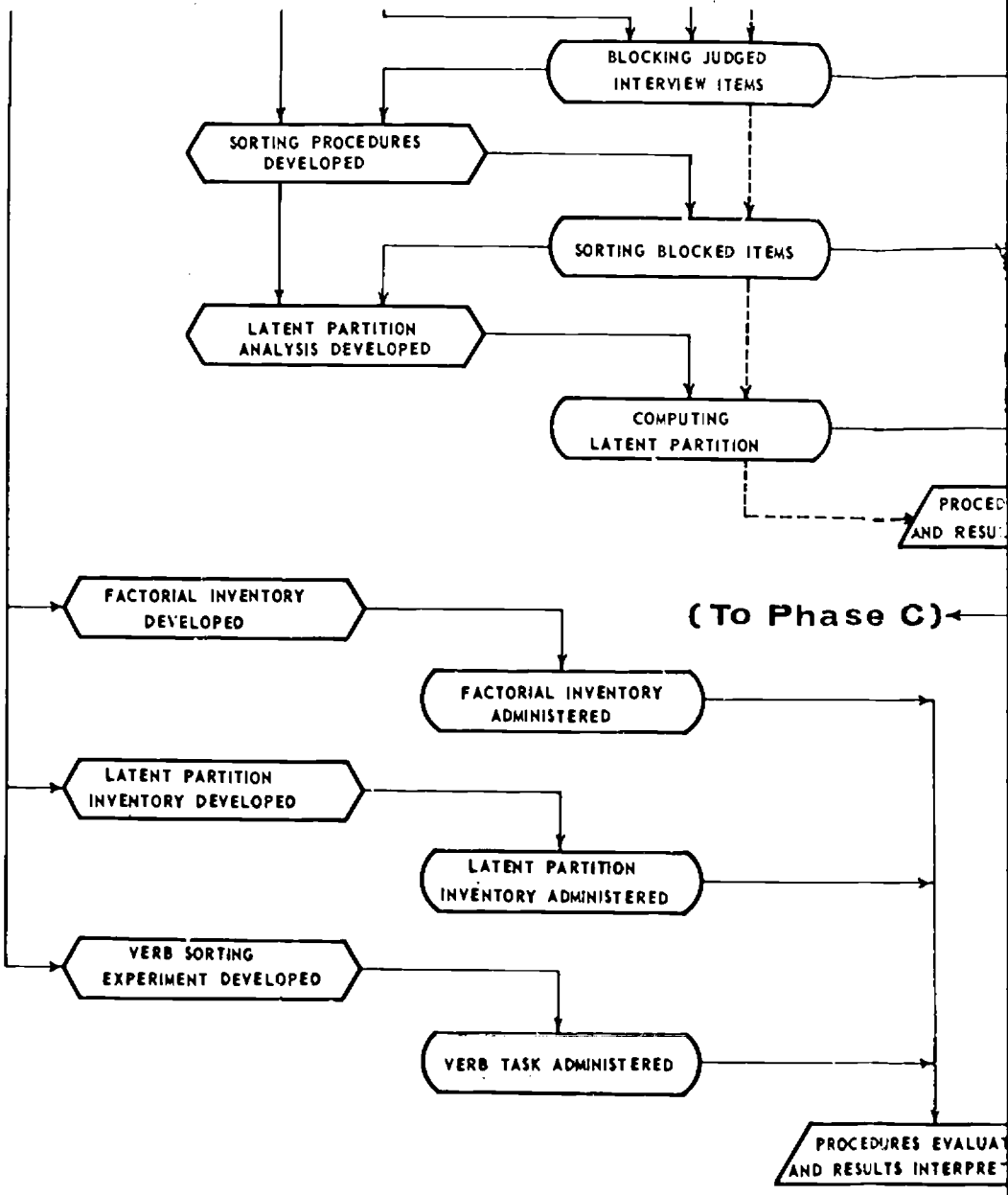
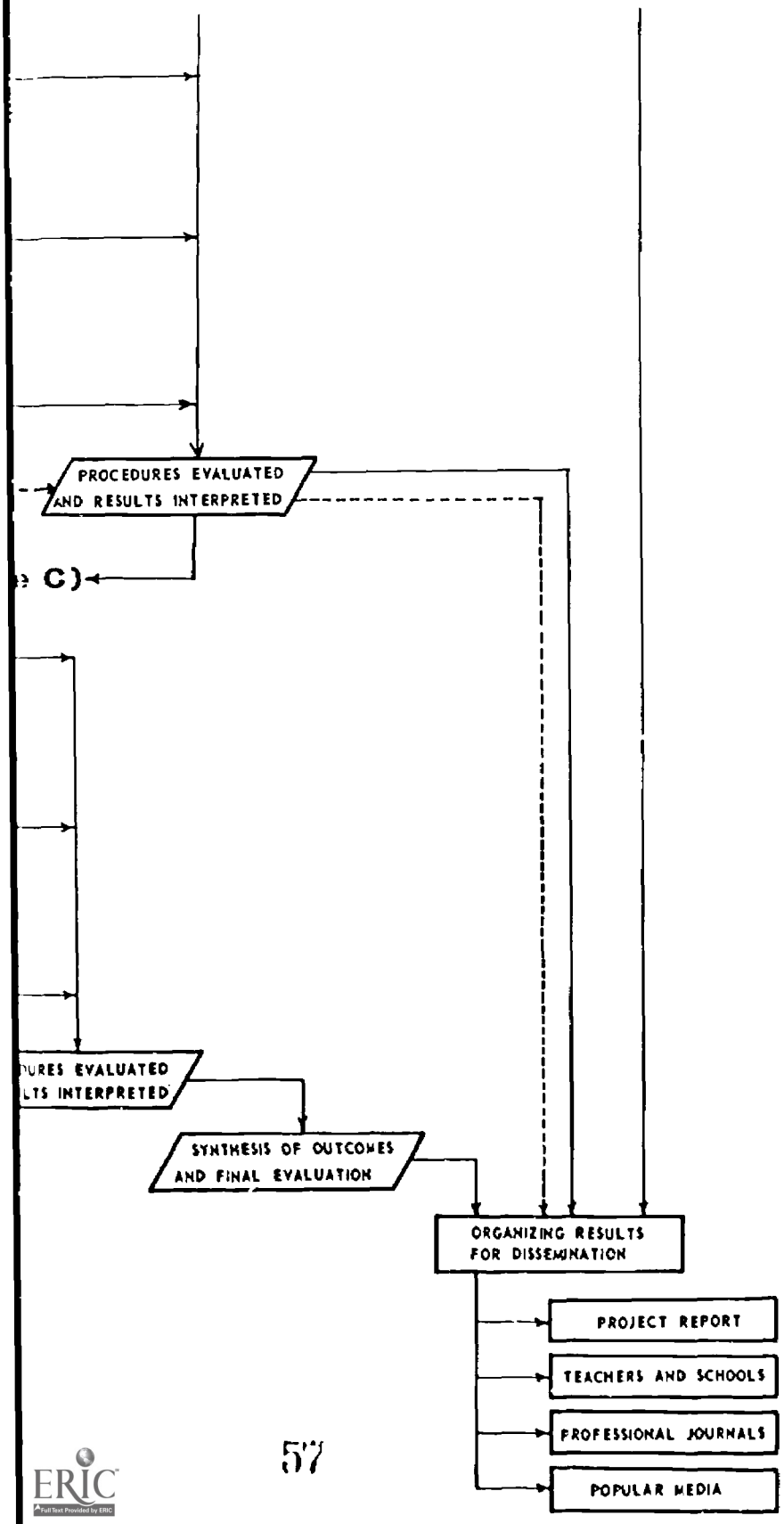

BLOCKING JUDGED INTERVIEW ITEMS
SORTING PROCEDURES DEVELOPED
SORTING BLOCKED ITEMS
LATENT PARTITION ANALYSIS DEVELOPED
COMPUTING LATENT PARTITION
PROCED
AND RESU
FACTORIAL INVENTORY DEVELOPED
(To Phase C)
FACTORIAL INVENTORY ADMINISTERED
LATENT PARTITION INVENTORY DEVELOPED
LATENT PARTITION INVENTORY ADMINISTERED
VERB SORTING EXPERIMENT DEVELOPED
VERB TASK ADMINISTERED
PROCEDURES EVALUA
AND RESULTS INTERPRE

SE E

MAY,

1966



Phase B, and they were used in Phase C with different s
actions and beliefs.

CATEGORIZING INTERVIEW CONTENT

In view of the project goals which had been specif
categorization. *Sorting procedures developed.* A sortin
no external categorization was assigned or suggested
thought to be most appropriate. *Sorting blocked items.*
varying conditions to determine the effects of a num
under the same set of controlled conditions. In Phase
statements into a set of exhaustive and mutually exclus

ANALYZING CATEGORY STRUCTURE

When administration of the sorting task was comp
method which would identify common and variable feat
and computational procedures were derived therefrom
analysis of qualitative data has been labeled Latent P
of latent categories (factors). *Computing latent partit*
One of these was the developmental sorting (N=90 it
employed in the analysis of the verb studies.

FACTORIAL INVENTORY

Development. An inventory of teaching situation
was to describe the ways in which factors of classroo
of classroom situations were postulated and explicat
inventory administered. This inventory was administe

LATENT PARTITION INVENTORY

Development. This second inventory of teachi
reason for developing this inventory was to determine
from the 600-item sorting experiment were rewritten
partition inventory administered. This inventory was
situations based on blocked items.

VERB SORTING STUDIES

Development. An abbreviated sorting task was
printed a single verb which was related to some imp
literature, and were selected to represent six hypothe
of teachers, student teachers and college students of e

INTERPRETATION, ORGANIZATION AND DISS

Throughout the project, the experimental proced
the objectives of the study. *Synthesis of outcomes*
structure and to put into perspective the results of the
Organizing results for dissemination. The outcomes
audiences. Besides this comprehensive final project
articles on the nature of the obtained latent categories
ing teachers and administrators in Wisconsin. Also, th

NTERVIEWS

content analysis developed. Observations of teachers' ideas were then on file in the form of tape recorded interviews; and it was necessary to dissect the record-e, analyzable units. Again, the objective was to preserve the content and style of the teachers. A two-step manipulation of recorded interviews satisfactorily s transformation. *Judging recorded interviews.* In the first step of reduction, two teachers (the judges) independently listened to each interview, and translated of discrete statements which described classroom actions and beliefs. *Blocking judged interview items.* To remove unnecessary redundancies and limit the : judged statements, a third teacher (the blocker) listened to each recorded interview while studying the two judges' reports. This teacher then divided judged i contained more than one idea and combined statements which represented the same idea. The judging and blocking procedures were standardized and used y were used in Phase C with different teachers and somewhat refined instructions. In both phases, the result was a pool of items describing abstracted class fs.

G INTERVIEW CONTENT

he project goals which had been specified, it was necessary to develop a method of categorizing the blocked items which used some teacher-regulated system of *sorting procedures developed.* A sorting task was devised in which teachers assigned blocked items to meaningful categories of their own invention. Here again, gorization was assigned or suggested to teachers by the researchers; teachers were directed to sort the statements into the kind and number of categories they t appropriate. *Sorting blocked items.* The sorting task was administered twice during Phase B. In the first experiment, 16 teachers sorted the materials under is to determine the effects of a number of variables on sorting behavior. In the second administration, each of eight teachers sorted the same set of 600 items t of controlled conditions. In Phase C, the sorting task was completed by 33 teachers sampled from cooperating districts. Each of these teachers sorted 128 set of exhaustive and mutually exclusive categories which were based only on the teacher's perceptual framework.

CATEGORY STRUCTURE

inistration of the sorting task was complered, there existed several independent categorizations of the same item pool. The problem then was to derive an analytical uld identify common and variable features of these categorizations. *Latent partition analysis developed.* A mathematical model of sorting behavior was formulated, al procedures were derived therefrom which were appropriate for analyzing the sets of categories manifested by a number of teachers. This technique for the tative data has been labeled Latent Partition Analysis (LPA), and is similar in scientific intent to factor analysis, in that its objective is to identify the structure es (factors). *Computing latent partition.* Latent Partition Analysis was applied to the categorizations obtained from two administrations of the sorting task. the developmental sorting of 600 items by eight teachers in Phase B, and the other was the Phase C sorting of 128 items by 33 teachers. LPA was also nalysis of the verb studies.

NVENTORY

t. An inventory of teaching situations was prepared in such a way that the items were defined by a specified factorial design. The purpose of the inventory he ways in which factors of classroom situations interact to influence teachers' judgments of the extent to which learning is facilitated. In this case the factors uations were postulated and explicated in the experimental design, and teachers' judgments were secured by means of a Likert-type rating scale. *Factorial tered.* This inventory was administered twice: once to a group of 51 teacher trainees, and once to a group of 38 experienced teachers.

ITION INVENTORY

t. This second inventory of teaching situations was prepared on the basis of results from the first large-scale administration of the sorting experiment. The pping this inventory was to determine whether latent categories could be reproduced by a factor analysis of the inventory item intercorrelations. Selected items n sorting experiment were rewritten into inventory format, and each of the resulting items was paired with a scale for rating the facilitation of learning. *Latent y administered.* This inventory was administered to over 200 teachers to test whether latent categories could be reproduced when teachers rated inventory on blocked items.

G STUDIES

t. An abbreviated sorting task was developed for which the sorting materials were contained in a packet of data processing cards. On each of 50 cards was verb which was related to some important aspect of teaching and the facilitation of learning. The verbs were extracted from interview materials and relevant ere selected to represent six hypothesized categories of teachers' behavior. *Verb task administered.* The verb sorting task was administered to several groups ent teachers and college students of education and psychology.

ION, ORGANIZATION AND DISSEMINATION OF RESULTS

the project, the experimental procedures which were developed and the empirical results of their implementation were evaluated and interpreted in the context of the study. *Synthesis of outcomes and final evaluation.* The completion of the empirical studies marked the beginning of the effort by the research staff to ut into perspective the results of the entire project. A related activity is the organization of the outcomes for communication in appropriate written forms. *s for dissemination.* The outcomes of this project have been differentiated on the basis of content and are being prepared for dissemination to a variety of de: this comprehensive final project report, there are articles on methodology being prepared for professional journals of measurement and psychology, and ture of the obtained latent categories are being prepared for educational journals. A synopsis of the important substantive results will be given to the participat-administrators in Wisconsin. Also, the results given in this final report will be rewritten for other sources of dissemination as needs arise.

The Triptych has three main sections; its primary focus is the center section, which is modified by a section on either side. The center section is a project flowchart, and its contents are differentiated according to vertical and horizontal dimensions.

Cells of the flowchart have four different shapes and are laid out in five main columns across the horizontal dimension. Rectangular cells fall in the left-most and right-most columns; they represent organizational and administrative aspects and events of the research. The flowchart begins, in the upper left corner, with organizational (administrative) events and it ends, in the lower right corner, with dissemination (administrative) events.

Hexagonal cells fall in the second major column; they indicate methodological-developmental activities and events. Completion of one of these activities was the final preparation of a set of procedures designed to produce data relevant to some major project concern. Rounded cells, in the third major column, refer to the collection or manipulation of data. As mentioned earlier, the purpose of data collection was either to test the applicability and reliability of a newly developed procedure or to gather information to be substantively interpreted.

Cells in the shape of a parallelogram mark the points at which the research staff made major evaluations of the procedures and corresponding results. These evaluations influenced subsequent developments, refinements, and implementations of procedures and the ultimate interpretations of results.

The second major dimension which differentiates flowchart content is vertical; the cells are divided into three main groups. The top group of cells includes those project events which were mainly concerned with the initial organization of the study and with the development and implementation of sampling procedures. Cells in the middle block of the flowchart reflect those events which were centrally related to the study of substance and structure of teachers' views of the facilitation of learning. The bottom group of cells denotes activities and events which occurred in conjunction with three ancillary studies. These three studies were less directly related to the central project objective than the events of cells in the group above.

The leftmost segment of the Triptych gives the chronology of the events and activities of the flowchart cells. The chronology of events is partitioned into five major phases. Phase A indicates the time consumed by initiating and staffing the project and by developing a sampling algorithm which would have general utility during the entire project. Phases B and C indicate the sequence of events related to the

study of substance and structure of teachers' views. On the flowchart, the progression between Phase B events is denoted by solid-line arrows and by dotted-line arrows for Phase C.

Phase B was entirely devoted to developing and testing methods for research. Phase C was concerned only with using the tested and refined research methods to collect final data. The methodologies developed during Phase B are those described in Section B (Chapters 5 through 9) of this report; the data collected during Phase C are those presented and interpreted in Section C (Chapters 10 through 14).

The events of Phase D were relatively independent of those in other phases; therefore, it overlaps chronologically with Phases B, C, and E on the Triptych. It was in this phase that the three main ancillary studies were conducted. The cells corresponding to these studies are shaded and set off somewhat from the rest of the flowchart.

Phase E is the dissemination phase; dissemination activities began in May of 1966.

The third major segment of the Triptych, given on the right side of the foldout, provides a brief commentary of the contents of flowchart cells. To explicate certain basic relationships among project events, descriptions in these paragraphs were written to pertain to sub-groups of flowchart cells. The research-relevant events of the project (but not its organization-relevant events) have been grouped into four sets of paragraphs. The first set contains one paragraph, Developing a Sampling Methodology. The second set contains three paragraphs related to interview studies. The third set includes two paragraphs, both related to categorization (sorting) studies; and the fourth set contains the three paragraphs which describe the three ancillary studies.

Again, the Research Triptych is the index to the organization of the remainder of the report; all of Chapters 3 through 14 are keyed to it and it is intended to integrate the contents of the entire document.

CHAPTER 3

THE CONTENT DOMAIN AND PREVIOUS RESEARCH

A perspective of the research reported here may be obtained by examining the content domain which was studied and reviewing prior research which is relevant to that domain. The purpose of this chapter is to provide such a perspective; the first section will define the general boundaries of the content domain, and the following three sections will discuss selected previous studies of classroom teaching, previous studies of categorization behavior, and methods of investigation.

a. DOMAIN OF CONTENT

The present research was concerned solely with elementary school teachers' views of facilitating learning. From this standpoint the investigation of the content domain of elementary classroom behaviors may be conceived as having two dimensions: a) the kind of substance contained in the domain, and b) the source of that substance. Each of these dimensions may be divided into two levels: the levels of substance are behaviors and events which are characteristic of elementary school classrooms, and behaviors and events which do not represent such characteristics of classrooms; the levels of source are behaviors and events as described by practicing elementary school teachers, and behaviors and events as described by persons not practicing elementary school teaching. The combinations of these levels of substance and source define four distinct sub-domains of content. These combinations are shown in Table 3.1.

TABLE 3.1

FOUR TYPES OF CONTENT DOMAINS

Kind of Substance	Source of Substance	
	Level 1: Elementary Teachers	Level 2: Non-elementary teachers
Level 1: Behaviors and events characteristic of elementary school classrooms	Content Domain A	Content Domain B
Level 2: Behaviors and events not characteristic of elementary school classrooms	Content Domain C	Content Domain D

Content Domain A concerns behaviors and events which characterize elementary school classrooms as described by practicing elementary school teachers; Content Domain B consists of behaviors and events which characterize elementary classrooms as described by non-elementary teachers; Content Domain C consists of behaviors and events which do not characterize elementary classrooms as described by elementary teachers; and Content Domain D consists of behaviors and events which do not characterize elementary classrooms as described by non-elementary teachers. The present research was confined to investigating the substance and structure of elementary school teachers' perceptions which are relevant to Content Domain A.

This typology is useful for comparing the substantive focus of this study with the foci of previous studies. An early study within Domain A was carried out by Charters and Waples (1929), who interviewed teachers to construct extensive lists of activities performed by teachers in the regular course of their daily duties. Several studies have been made of Domain B; many of these studies have occurred during the past decade and have been defined by the researcher, who used a theoretical scheme to observe and tabulate classroom behaviors and events. For example, Anderson, Brewer and Reed (1946) analyzed nursery school classrooms according to a system of observation categories defined in terms of dominative and integrative behaviors.

Illustrative of investigations of Domain C is the work of Jersild (1955), who asked teachers to provide information about their personal attitudes and adjustments to teaching. Studies related to Domain D have often endeavored to predict the teaching performance of teacher trainees on the basis of personality measures. For example Cole (1961) attempted to predict teaching success of undergraduate education students from their responses to the MMPI and the Rorschach.

This two-way classification of content domains should be regarded only as a tool for distinguishing the focus of the present research from foci of previous investigations. It should be noted that Content Domain A is not related to student achievement. However, a study of the relationship between varying teacher perceptions and student achievements could be based on this research. The present approach was based on the assumption that the substance and structure of teachers' views are relevant to the ways in which a teacher stimulates and directs the learning of students. That is, what a teacher expects his students to do in the classroom, what the teacher himself does in the classroom, and the particular events which will result from a teacher's behavior will be based on the way in which the teacher perceives the process of facilitating learning.

It should be noted that these content domains do not include an evaluation dimension. It was not an objective to determine whether teachers agreed or disagreed about the "rightness" or "wrongness" of particular classroom affairs. Measuring quantitatively the extent to which teachers differed in their views was not at issue; this investigation was a search for ways of thinking which were common to several teachers. In one sense the researchers were asking, "What are the normative aspects of several teachers' views? What kinds of behaviors and events do they perceive in the same way?"

An analogy may be drawn between the structure of teachers' views and the structure of snow crystals. Though snowflakes seem at first to be a homogeneous phenomenon markedly different structures may be discerned among them upon detailed examination (Bentley and Humphreys, 1931). The characteristic of common-but-unique structure of snowflakes is illustrated by the photographs in Figure 3.1.

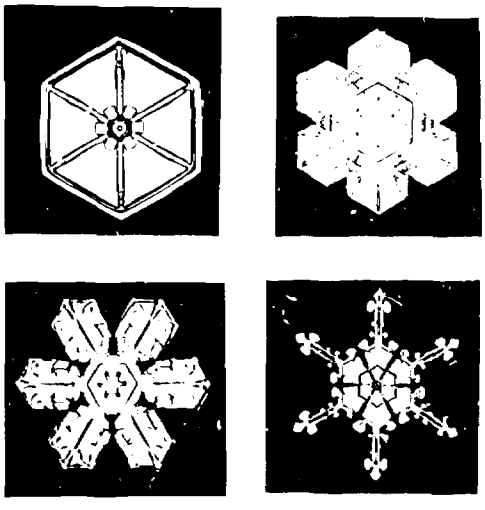


Figure 3.1 Photographs illustrating the common-but-unique structural qualities of snowflakes.

The classification of relevant content given in this chapter also reveals the importance of obtaining 1) descriptions of classroom-relevant behaviors and events from practicing elementary teachers, and 2) description of behaviors and events which such teachers considered to be characteristic only of the classroom. Chapter 5 reports the extensive efforts made to fulfill these conditions. The design of interview schedules provided the basic means for limiting teachers' descriptions to classroom affairs and preventing descriptions of more general school or professional affairs. The research intent was to initiate an approach to systematizing knowledge which teachers had distilled from their experiences and learnings related to

teaching practices. The substantive domain investigated might be considered a result of pre-classroom experiences and training, as well as practical experiences in the classroom. The origins of a teacher views are diagramed in Figure 3.2.

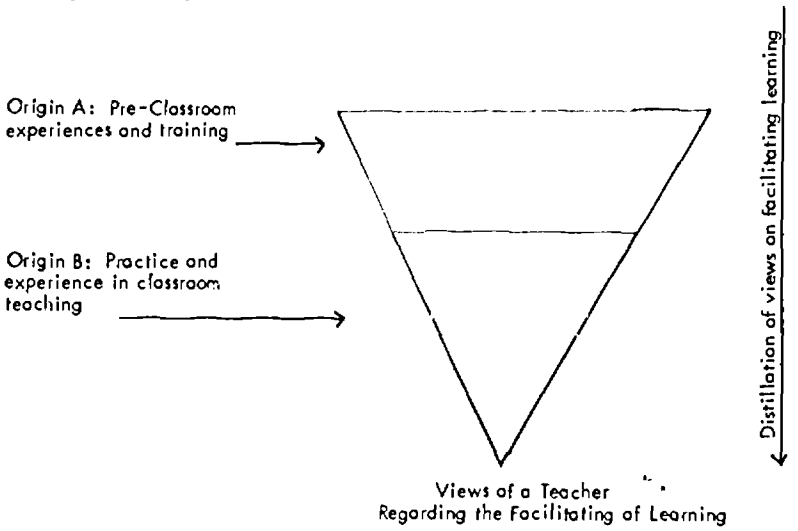


Figure 3.2 Origins of a teacher's views.[1]

The content domain investigated was the pooled views of several teachers whose perceptions and cognitions were thought to result from a distillation of pre-classroom and classroom experiences and learnings. The substance and structure of such a domain might then be expected to differ from a domain of content relevant to facilitating classroom learning obtained from another source. For example, the accumulated findings of laboratory research on learning have led to emphasis of several quite formalized constructs such as motivation, reinforcement, and response-set. This research, therefore, might be regarded as one approach to the discovery of knowledge concerning the facilitation of learning, while laboratory research on learning is quite another approach. This dichotomy is portrayed in Figure 3.3. These two sources are not considered to be operationally independent.

[1] Figure 3.2 is an adaptation of a diagram by N. Bush which appears in E. R. Smith (Ed.), Teacher Education: A Reappraisal, 1962.

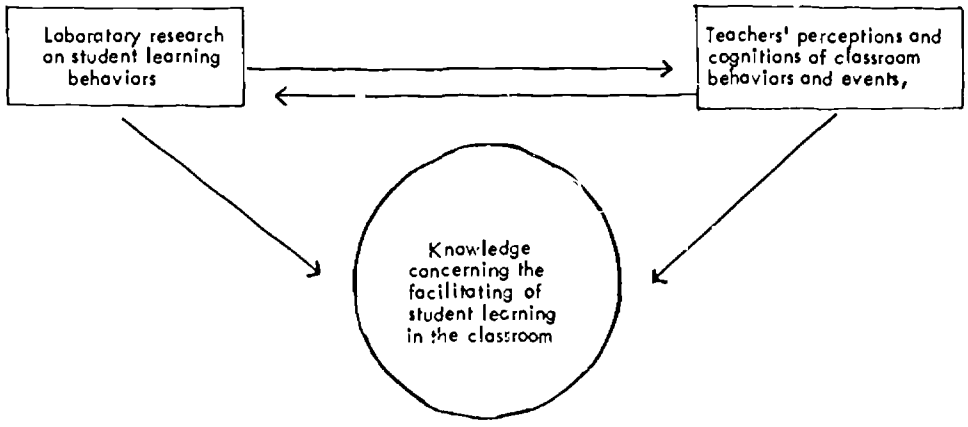


Figure 3.3 Two approaches to the development of a body of knowledge about facilitating learning.

This investigation focused only on the teacher's point of view. To rephrase the title of a series of booklets published by the National Education Association, the intent was to find out "what the teacher says to the researcher." The importance of such an endeavor is that improvement of teaching depends upon information concerning the existing state of teachers' thinking. Changes needed and how changes may occur are conditioned by the state of what is to be changed, for existing conditions form the foundation upon which change may be accomplished.

b. STUDIES OF CLASSROOM TEACHING

An endeavor was made to identify previous investigations of content Domain A by surveying relevant research literature. A detailed study was made of Psychological Abstracts from 1958-64 with particular attention to identifying research tools which had allowed observation of teachers' descriptions of classroom-relevant behaviors and events. A search was made of abstracts listed under the index headings "Classroom," "Instruction," "Teacher," and "Teaching." In total, 847 abstracts were tabulated and read to determine their relevance to the present research. Eighty-seven relevant studies were selected; each of these was then read in its original form with particular attention to extracting the substance of the data collection instruments. As shown in Table 3.2, only 31 reports were found to contain examples of in-

struments considered relevant to the investigation of teacher viewpoints.

In a similar but less detailed way, a survey was made of reports listed in the Education Index, 1955-65. This survey involved scanning entries listed under the general heading "Teaching." Under this heading, several major sub-areas were studied in further detail: 1) entries concerned with general aspects of teaching, 2) teaching aids and devices, 3) teaching methods, 4) educational research, and 5) evaluation of teaching methods. A summary of the tabulated listings is given in Figure 3.4. Over 1200 entries were listed under the several sub-areas of "Teaching," with a total of 55 entered under "Research."

Very few studies of classroom teaching were identified as helpful in the present investigation. A similar result was obtained from survey of the two major source books in research on teaching edited by Harris (1960) and Gage (1963). Several studies were found to involve the interviewing of elementary teachers (Charters and Waples, 1929, Becker, 1952; Biddle, Rosencranz & Rankin, 1961; and Peterson, 1964). A considerable proportion of those identified as relevant reported the use of structured questionnaires with items describing classroom behaviors and events. Most notable in this respect was the work of Sorenson and Huzek (1963), who report careful construction of questionnaire items to obtain information from teachers.

The general conclusion drawn from surveys of the literature was that new techniques were needed to investigate the content domain implicit in the research objective.

TABLE 3.2

STUDY OF RESEARCH STUDIES LISTED IN PSYCHOLOGICAL ABSTRACTS, 1958-1964

Index Heading	Number of Reports Listed		Selected Reports		
	Total	Selected for Searching	Annotated, Giving Examples of Items	Annotated, Not Giving Examples	Not Annotated
A. Classroom	68	9	6	0	3
B. Instruction	49	1	0	0	1
C. Teacher	196	31	6	2	23
D. Teaching	534	46	19	5	22
Totals	847	87	31	7	49

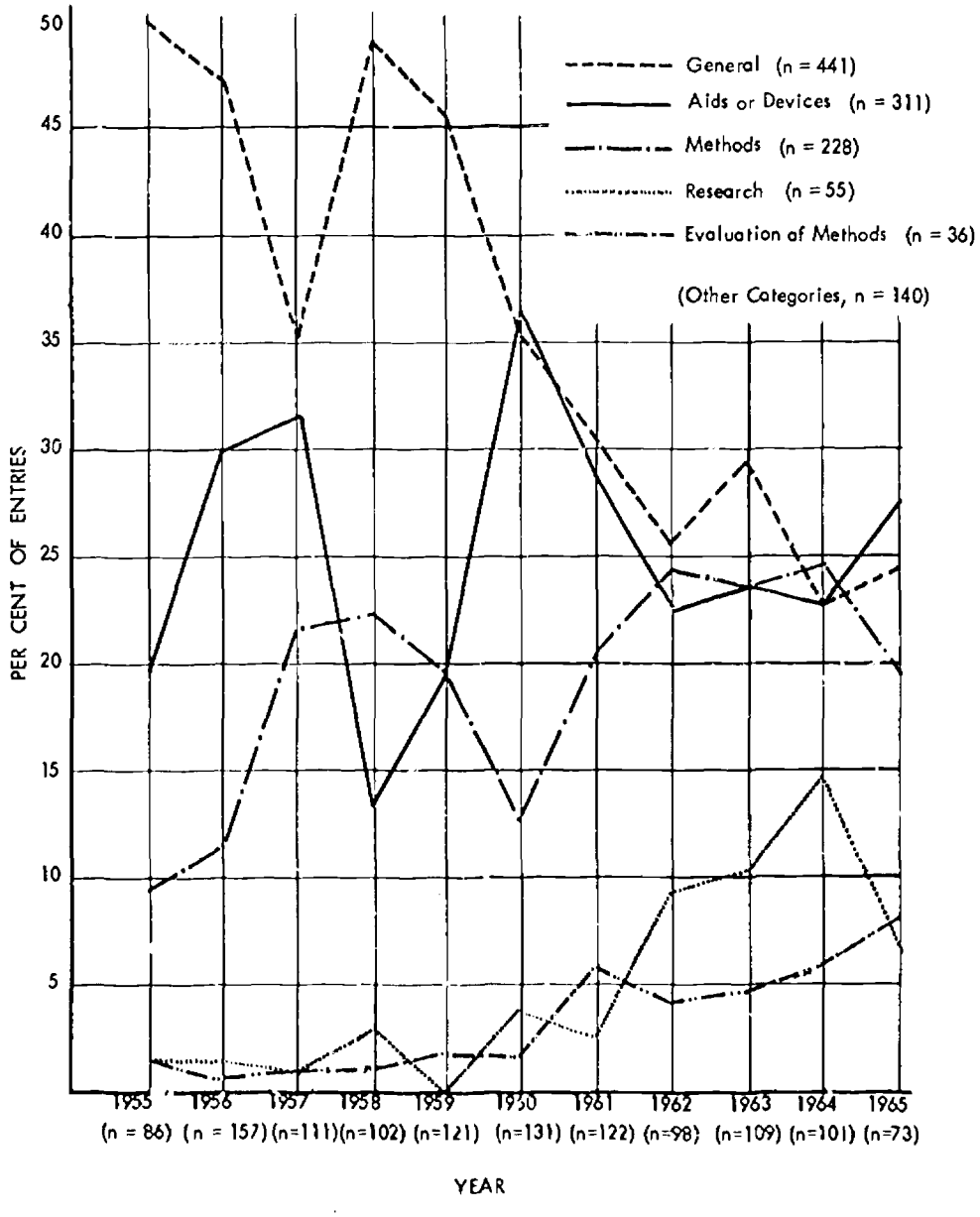


Figure 3.4 Distribution of entries under the heading "Teaching" in the Education Index, 1955-1965.

c. STUDIES OF CATEGORIZATION BEHAVIOR

From a strictly psychological standpoint, the present research was concerned with investigating teachers' concepts of classroom behaviors and events. Though extensive literature exists on the psychology of concept behavior, no studies were identified which were directly relevant to teachers' views of classroom learning. The accumulated knowledge of the psychology of thinking, however, emphasizes the central importance of concept formation in the nature of human thinking. Most pertinent to the present research are the studies by Bruner, Goodnow and Austin (1956), in which they demonstrated the basic process of concept formation and stated clearly the importance of categorization behavior.

Bruner, et al., list five important functions served by categorization: 1) reduction of the complexity of the environment, 2) provision of means by which the objects of the world about us are identified, 3) reduction of the necessity for constant learning, 4) provision of direction for instrumental activity, and 5) the ordering and relating of classes of events. To identify objects is to place them in classes. As the authors point out, things which cannot be classed, for example, strange sounds on a dark night, can cause terror. Perhaps, they suggest, this terror is caused by not having the object categorized so that proper instrumental activity can follow. The most germaine function of categorization behavior for this research is that of grouping objects or events on attributes they are observed to have in common with other objects and events. This process reduces the complexity of the environment and allows one to deal with classes of similar phenomena, rather than with each object or event as discrete.

Teachers probably categorize aspects of the classroom environment to reduce the complexity of the astronomical array of activities and events which occur daily. Each behavior or event cannot be dealt with as being discrete. Some grouping of discrete behaviors or events is needed. Each teacher, in his own way, makes certain acts and occurrences approximately equivalent. In this sense, the research objective was to identify the equivalences common to the perceptions of several teachers in a variety of classroom behaviors and events. By such identification the researchers hoped to make observable and to explicate the ways in which teachers reduce the complexity of the classroom environment.

Brown (1958), in his discussion of language and categories, points out that every person who speaks a language has made a set of linguistic categories. Among these are sound or phonemic categories which permit the person to react to physically different sounds as similar. For example, the 'p' sounds in the

English words 'pat' and 'speak' are perceived as equivalent. Thai children will learn to make different categories for these sounds, while English children will learn to include them in the same category.

Linguistic categories are related to non-linguistic categories, but the exact relationship is not understood. Linguistic categories, when patterned according to the rules of a particular language, make up speech which 1) can signal the existence of a non-linguistic category (e.g., The biology professor who uses the word "coelenterate" indicates the existence of a category which students will later fill in.) and 2) can help to show what a person's non-linguistic concept is by the linguistic signs which he attaches to objects or events in the world. Whorf (1956) was among the first to point out the language manifestations of such perceptual-cognitive categorizations. After commenting that the Hopi have two words describing conditions of water while English-speaking people only have one, and that Eskimos have three words for snow whereas the English language has only one, Whorf writes, "Languages classify items of experience differently. The class corresponding to one word and one thought in language A may be regarded by language B as two or more classes corresponding to two or more words and thoughts" (p. 210).

A detailed account of the importance of conceptual behavior for educational practice has been given by Klausmeier and Goodwin (1966):

> Concepts serve two main functions in human behavior: as responses to objects and events by which they are classified or categorized, and as mediator between stimulating events and subsequent behavior (p. 219).

Although the importance of concept formation has been increasingly applied to learning behaviors of students, no previous research seems to have investigated the substance and structure of teachers' concepts with regard to facilitating classroom learning.

d. METHODS OF INVESTIGATION

The surveys of the relevant areas of the literature failed to yield a satisfactory empirical procedure for studying the views of teachers. Popular methods for investigating teachers' perceptions and cognitions of matters relevant to classroom learning have been questionnaires and multiple-choice tests. A major drawback of such methods was that the researcher must impose his views on the teacher in the construction of questionnaire or test items.

In the present study, content units (see Chapter 1 or 5) could have been manipulated into questionnaire format (see Chapter 9). To illustrate, if a teacher had related that he had children write experiences in a notebook, an item of the following kind could have been produced:

(content unit) This teacher related that he has children write experiments in a notebook listing methods, what they did with them, and describing what else could be used in the experiment.

(charge) Decide which of the following alternatives most appropriately represents your viewpoint of this practice:

Check one

(response alternatives)

a. _____ This practice involves the student in the organization of verbal materials.

b. _____ This practice fosters pupil initiative.

c. _____ This practice contributes to the teacher's variety of teaching approaches.

d. _____ This practice is useful as a non-directed activity for the students.

In constructing such an item the investigator is required 1) to select the format of presentation, 2) to select the context of the descriptive statement and response alternatives, 3) to select the kinds of alternatives presented, and 4) to select the criterion by which the respondent will make "his appropriate choice" of an alternative. The present researchers certainly do not, in general, disagree with this strategy, but for the purposes of the present study, this technique was not considered appropriate.

Various content analytic techniques have been used in studies of teaching.[1] During the past two decades, an increasing number of researchers have used these techniques to develop and use a set of a priori categories for the analysis of observable behaviors in the classroom. Withall (1949) developed a set of categories which described the socio-emotional climate of classrooms by using transcribed tape-recordings of classroom instruction sessions. He later used these for the interaction analysis of teacher-pupil behaviors. The inductive development of an exhaustive, mutually exclusive set of categories on the basis of observational, anecdotal, qualitative records is fraught with numerous difficulties. Some of these hazards may be avoided by deducing a set of categories from the content analysis of unorganized, descriptive records.

Whether an inductive or deductive approach is used, a major issue is defining a framework within which researchers can "sift and winnow" the raw, observational information. Barton and Lazarsfeld (1955) provide an excellent review of the problems and possibilities of researching non-quantified data:

> What can a researcher do when confronted by a body of qualitative data--detailed, concrete, non-metric descriptions of people and events, drawn from direct observation, interviews, case-studies, historical writings, the writings of participants? ...One must organize the raw observations into a descriptive system. In some cases, one has only to apply categories already set up by previous investigations or by the society itself, and proceed with the further stages of analysis. In other cases, previously existing categories are clarified and revised by the attempt to apply them to a concrete body of data. And in some cases the researcher must create his own classification system for the material under study.

The first essential step in systematizing these data is the preparation of a preliminary classification:

> Until the data are ordered in some way, the analysis of relationships cannot begin; more refined categories normally develop out of the attempt to analyze relationships between preliminary categories; there is an interacting process between refinement of classification and the analysis of relationships.

The review of approaches to the analysis of qualitative material provided by Barton and Lazarsfeld describes the strategies often used by social scientists. Among the efforts to improve the rigor of content-analytic techniques has been the work of Schutz (1958), who considered a variety of factors pertinent to the categorization of qualitative data. Also related is the research dealing with judgmental classifications of achievement test items (Pruzek, 1967). Bloom (1942) and Vaughn (1950) were among the first to employ item classification. Ebel (1953, 1954) seems to have been one of the earliest to develop a specific procedure which has been updated by the more recent work of Stoker and Kropp (1964).

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[1] For a discussion of this literature see F. N. Kerlinger, Foundation of Behavioral Research, 1964.

The investigators of this project decided that the existing content-analytic techniques were inappropriate. The essential weakness of existing techniques was that even in the preliminary descriptive classification work, the researcher put his ideas into the data. The present project required an approach which relied completely on empirical induction of systematic analyses. In response to this requirement, the interview schedules, content summarization procedures, and sorting procedures were developed. Though these procedures allowed systematic, empirical summarization of the interview recordings, a further research requirement was that of finding a technique which would explicate the content structure of the several manifest categorizations. That is, a method was needed for testing the hypothesis that identifiable latent categories underlie manifest categorizations. Of the various techniques applicable to the analysis of qualitative data, Latent Class Analysis (Lazorsfeld, 1950) was most relevant. This is a procedure for reducing a matrix (subjects by items; dichotomously scored [0-1] into a set of vectors. Each vector entry specifies the probability that a subject in a content class (category of subjects) will respond positively to an item. In addition, this procedure yields the probability that a subject with a particular response vector belongs to a particular latent class. This technique was not appropriate for the present project, however, since the need was for a latent categorization of items which would allow explication of the substance and structure of teachers' views. As shown in Chapter 7 and in Appendix G, the technique developed, Latent Partition Analysis, is a procedure for reducing several independent sortings of a set of items into a set of latent categories.

CHAPTER 4

METHODOLOGICAL GUIDELINES AND VIEWPOINTS

The research objective required appropriate procedures for observing, summarizing, simplifying, and describing teachers' perceptions. A survey of the extant literature failed to reveal any procedures which were useable for achieving the objective. Consequently, the development of the research approach outlined in Chapter I had to be based on general methodological principles, rather than on known content and method domains. The first section of this chapter discusses the four major guidelines used in developing appropriate procedures. The second section describes the research viewpoint in terms of the methodological intentions of the researchers.

a. GUIDELINES FOR DEVELOPMENT OF EMPIRICAL PROCEDURES

No unique set of empirical procedures provides the only way of achieving a particular research objective. Although various alternatives usually exist, selection of particular strategies must be made in terms of research guidelines, for techniques appropriate to the investigation of one phenomenon are often inappropriate for studying another phenomenon. In the present project four methodological guidelines were used in considering alternative procedures:

1. Hypothesis building is a functional tool for evaluating alternatives.
2. Description and analysis of the conditions under which procedures are carried out and observations made are essential to the objectivity of research strategies.
3. Replication of procedures is a sine qua non of good research.
4. Documentation of operational aspects of new research techniques facilitates the standardization of those operations and the communication of accumulated experience.

Each of these guidelines is pertinent to every step of the research work; they do not express four distinct phases. At the beginning of the project, for example, initial efforts were focused on interviewing teachers. Developing and executing interview plans involved 1) formulating hypotheses of the information which would be observed and recorded by interview techniques, 2) describing and analyzing factors relevant to the selection of interviewees, 3) building interview procedures which would be replicable, and 4) documenting the specifications of interview operations. Evaluation of procedural alternatives was based primarily on whether a particular procedure would lead to valid information concerning the substance or structure of teacher viewpoints.

Role of Hypothesizing

The formulation of hypotheses serves a useful function in research by aiding the specification of particular research goals. However, distinctions may be made among different natures, types, and levels of specificity which characterize hypotheses. Formulating hypotheses in educational research typically involves specification of expected substantive or quantitative relationships among several variables, and there is a tendency to regard statistical hypotheses as the only valid form of hypothesis. In the present investigation, no detailed statistical hypotheses were formulated for the expected outcomes of a particular set of procedures. Rather, plans and expected outcomes were considered in terms of the qualitative and methodological characteristics of certain operations and in the terms of the kind of information which the researchers wanted to obtain by carrying out those operations. Thus, the function of the hypothesis was that of assisting in research planning by serving as a tool for contemplating and evaluating alternatives.

From the viewpoint of hypothesis formulation, the central project objective might be expressed in several ways. One such hypothesis is:

> If the entities of teachers' perceptions and cognitions regarding facilitating learning in the classroom are systematically interrelated, then orderly, non-random patterns of relationships can be identified as underlying certain aspects of the perceptions and cognitions of several teachers.

This kind of hypothesis was important in guiding the development of procedures which allowed teachers to manifest and explicate their perceptions of a set of content units. The sorting procedures were designed to allow individual teachers to overtly express the interrelationships perceived among content units. This hypothesis suggested that common patterns of relationships among several manifest categorizations might be discovered. The search for possible common patterns underlying several manifest partitions was made possible by inventing a mathematical model which permitted the display of the latent structural interrelationships of several partitions.

Throughout the research work, hypothesis formulation was restricted to methodological problems. Consequently, from a substantive standpoint, the research was atheoretical; no predictions or theoretical constructs were proposed for the character of the content of teachers' viewpoints. Exception to this approach was made for three ancillary studies (see Chapter 8 and 9), but in general the researchers endeavored to minimize the influence of methodological developments by making substantive predictions about

teachers' views. To rephrase Charney (1967), the modus operandi was "We wondered what would happen if --------?"

Description and Analysis of Procedural Conditions

The development of methods for securing adequate and proper data requires attention to a wide variety of details, some of which are not directly related to operational procedures.[1] During the early phases of the project, considerable attention was given to describing and analyzing the conditions under which the observational techniques were to be conducted. Attention to these matters would not only provide replicability and documentation of the operations but it would also ensure recognition of circumstances which would facilitate effective administration of the procedures. For example, the initial specification of the sorting task involved few directions to the sorters, and only a brief explanation of the importance and purpose was given for each step of the task. In the attempt to describe the nature of the task, it became necessary to prepare a very detailed set of directions and a rather long training session (see Chapter 6 and Appendix F for details). The complexity and length of this training caused the researchers to doubt its necessity. Several attempts were made to abbreviate the directions and the training, but these attempts resulted in less satisfactory sorting performance. This was especially true of the clarity of the resulting manifest categories.

The guideline for describing and analyzing procedural conditions was also found important in developing the content analysis procedures for interviews (see Chapter 5). Concern for the multiple complexities of interviewing provided a perspective for improving the performance of the interviewers. Not only did interview experience increase the sensitivity of the interviewers, but continuing analysis of particular interview recordings indicated the desirability of variation in the sequence of posing questions for the interviewee. Similarly, concern for the detailed description of judging and blocking procedures led to improvements in the training of teachers who performed these functions. Though many of the improvements were of an administrative nature, considerable improvements were also made in the efficiency and effectiveness of the procedures.

[1] W. A. McCall, in How to Experiment in Education, 1923, described conditions for gathering "adequate and proper data."

Neglecting the description and analysis of procedural conditions might have resulted in limited generalizability of operations. Insufficient characterization of the relevant circumstances can lead to over simplifying or overlooking the complexities which initially appear to be irrelevant. In general the researchers endeavored to prevent such hazards by experimentally investigating procedural factors which could be manipulated (e.g., Sorting Experiment No. 1, Chapter 11). Where experimentation was not possible, detailed documentations were prepared. It was not feasible, within the limits of the project resources, to investigate experimentally many of the factors which might jeopardize the validity of the procedures; hence the new techniques presented in this report must be considered as a preliminary specification of some promising observational tools.

Replicability of Procedures

For an empirical procedure to be useful beyond its first application, certain conditions need to be satisfied to ensure that it is replicable. Replicability for procedures of this research was provided by specifying operations in at least one of three ways: 1) complete detailed definitions, 2) applications of sampling principles, and 3) experimental manipulations. In all cases it was possible to prepare detailed definitions and specifications of operations, while in some instances it was feasible to sample and to manipulate experimentally.

Detailed specification. All empirical procedures developed were defined and described in detail. Decisions about a particular operation or series of operations were often intuitive (due to limited resources) and as a consequence detailed specification was the only course for providing a basis for replication. For example, it was not feasible to explore all the various ways in which a teacher could perform a task. Many of the task variables of the sorting procedure require experimental investigation before validity or generalizability can be established. However, attention was given to specifying these operations and observations which appeared to be critical for the successful administration of the sorting procedures (see Chapter 6 and Appendix F).

Sampling applications. When it was possible to select from a series of alternatives, sampling principles were used for specifying the operations. It was possible to use sampling in the selection of teachers for interviewing and for sorting studies, and in the selection of content units for sorting. In the case of selecting interviewees and sorters, a population of teachers was defined and stratifying dimensions were specified (see Chapter 5 . The stratification of the teacher population made possible the design of a multi-

stage sampling plan, which permitted unbiased selection of teachers for participation in interviewing and sorting studies. In selecting content units for the sorting task, a finite population of units was defined and a sub-set of units was randomly drawn to be used in the experiments.

Experimental manipulations. Under certain circumstances, it was necessary to choose among a relatively small number of procedural alternatives. In such cases, final decisions were delayed until at least one experimental study was conducted to evaluate the alternatives. For example, two factors were important for finalizing the sorting procedures: 1) the effect of pooling content units from several interviews on sorting behavior, and 2) the consequences of directing teacher-sorters to re-sort at certain stages of the sorting procedures. It was considered important to evaluate the variability in manifest category formation which might be associated with selecting content units from several sources and with choosing a point at which the units were re-sorted. Two experimental investigations of these factors were made (see Chapter 11) before final specifications were made of the sorting instructions.

Documentation of Operations

Detailed documentation of research operations not only provides replicability, but it also serves as a mechanism for recording and communicating pertinent experiences and suggestions. The researchers felt that this was of particular importance for the procedures of interviewing, summarizing content, sorting, and constructing inventories. Consequently, continuous records were maintained during the development of these procedures to accumulate relevant experiences and suggestions. The chapters and appendices corresponding to these procedures are the final summaries of this accumulated information. Such documentation was of special value in standardizing the administration of data collection procedures. Moreover, presenting the documentation provides a basis for displaying the objectivity of the procedures.

b. RESEARCH VIEWPOINT

Research investigations described in this report were essentially exploratory and descriptive. Because there were very few established concepts and very little previous experimentation relevant to the project, all that could be done was to "make only the crudest first map of a new domain."[1] The research position was also founded on Thurstone's (1947) statement that:

> The mind is structured somehow; the mind is not a patternless mosaic of an infinite number of elements without functional groupings. The extreme, opposite view would be to hold that mind has no structure at all. In the interpretation of mind we assume that mental phenomena can be identified in terms of distinguishable functions, which do not all participate equally in everything that mind does. It is these functional unities that we are looking for....

The explanations reported herein should be regarded as initial efforts to differentiate and to classify the perceptual and cognitive entities of teachers' views. The importance of such an endeavor has been succinctly stated by Sokal (1966), who wrote:

> Classification is one of the fundamental concerns of science. Facts and objects must be arranged in an orderly fashion before their unifying principles can be discovered and used as the basis for prediction. Many phenomena occur in such variety and profusion that unless some system is created among them they would be unlikely to provide any useful information.

The methodological problem was to derive a means for classifying the sampled entities of teachers' perceptions and cognitions. To accomplish this, the researchers avoided making substantive theories or creating a priori models, paradigms or logico-deductive schemes of the substance of teachers' thinking. The intent was not to find the "best" solution, but to find a demonstrably useful approach, in the same sense that Kimball (1958) has described a "good solution:"

> All too frequently when a 'best' solution to a problem has been found, someone comes along and finds a still better solution simply by pointing out the existence of a hitherto unsuspected variable. In my experience when a moderately good solution to a problem has been found, it is seldom worth while to spend much time trying to convert this into the 'best' solution. The time is much better spent in real research....

---

[1] This phrase was used by L. L. Thurstone (1947) to describe one aspect of the scientific purpose of multiple factor analysis.

At a time when the vogue in educational research appears to be model-building and deducing innovations from metatheories, the present research may well appear to be anachronistic and contrary to more "advisable" strategies. But a basic purpose of research is to coordinate theory and fact. This observation is not restricted to educational researchers:

> "Tell me, Mr. Mason, are you a student of psychology?"
>
> "Practical psychology," the lawyer said. "I don't go much on theory."
>
> "You have to interpret facts in terms of theory in order to understand them," she said didactically.
>
> Mason grinned. "It's been my experience that you have to interpret theories in terms of facts in order to understand theories."[1]

1 From E. S. Gardner, The Case of the Shoplifter's Shoe, 1938.

PART II

Methodologies for Defining Substance and Investigating Structure

CHAPTER 5

BOUNDARIES OF THE RESEARCH DEFINED BY CONTENT AND PERSONS

The boundaries of this research may be defined in terms of the domain of content studied and the population from which teachers are sampled. These two facets of the research will be specified operationally in this chapter. First, a discussion will be given of the interviewing procedures developed for gathering teacher descriptions of classroom-relevant behaviors and events; second, a description of the process used for summarizing tape-recorded teacher interviews will be given; and third, the approach used for defining the population sampled for participation in the research work will be reported.

a. THE DOMAIN OF CONTENT DEFINED BY INTERVIEWING PROCEDURES

The substantive research objective was defined in Chapter 1 as being the observation and recording of teachers' descriptions of classroom-relevant behaviors and events concerning the facilitation of learning. The essential requirement was that these descriptions be made by teachers under conditions which allowed them freedom to select the behaviors--including their own thinking--and events reported, freedom to form the manner of description, and freedom to express the relevance of a behavior for facilitating learning. The behaviors and events described in the interview were to be limited strictly to the teacher's perceptions and cognitions about facilitating learning. Other aspects of classroom and school affairs, such as development of curriculum guides, or the separation of the church and state in education, were relevant only if a teacher considered sub-aspects of such affairs to be descriptive of his views of facilitating learning. Discussion in this section will report the construction and standardization of interviewing procedures in terms of 1) selection of the interview method, 2) development of interview schedules, and 3) conditions of interview administration.

Selection of the Interview Method

A variety of methods exist by which teachers could have been asked to express their views of facilitating learning. Five methods were mentioned and exemplified in Chapter 1: 1) lesson plan reports, 2) autobiographical writings, 3) interviewing procedures, 4) content analysis of teacher reports, and 5) essays. In addition, several techniques have been reported in the literature which are intended to structure respondents' reports without inhibiting their freedom of expression. For example, Flanagan (1954) developed the critical incident technique; Mead and Métraux (1957) reported success with a written open-

ended question procedure, and a variety of other questionnaire survey techniques have been used extensively by social scientists (for example, Young, 1956).

A survey was made of the various techniques mentioned above, and detailed consideration was given to their operational characteristics with particular attention to their amenability to empirical response analysis. The researchers decided that some form of interviewing was the observational technique most likely to yield results consistent with the project objective as stated in Chapter 1. The basis for this decision was that interviewing provided the advantages of:

1) a more direct access to the information (i.e.,teachers' perceptions, beliefs, and ideas) than did other methods,
2) freedom of form for the teacher in stating his responses, and
3) flexibility for the interviewer in conducting the interview.

Further consideration of the exact form of interviewing techniques which might be employed suggested that the most satisfactory procedure would be a focused free-response interview similar to that reported by Merton, Fiske and Kendall (1956). The characteristics of this type of interviewing have been summarized as follows by Kerlinger (1964) and by Richardson, et al. (1964):

1) Respondents have the opportunity to be spontaneous in stating their ideas.
2) Interviewees are given "an opportunity to express [themselves] about the matters of central significance."
3) Interviewees are able to place their responses in "their proper context rather than forced into a framework which the interviewer considers appropriate."
4) Interviewers can adapt to the individuality of each interviewee and can be flexible in stating, repeating, or rephrasing questions.
5) Interviewees are occasionally able to take the lead rather than to be dominated continually by the interviewer.

The selection of the focused free-response interview was followed by a series of developmental studies for the purpose of deriving the exact interviewing procedures.

Development of Interview Schedules

A search of the literature failed to disclose a free-response interview schedule which could be adapted for the purpose of this study. Therefore, it was necessary to undertake a series of developmental studies designed to produce a satisfactory schedule. The steps taken to produce the final schedule were carried out during Phases B and C (see Foldout A, Chapter 2) and are shown in Table 5.1. After

TABLE 5.1

DEVELOPMENT OF INTERVIEW SCHEDULES

Conditions of administration	Sequence of Interviews[a]						
	Time 1	Time 2	Time 3	Time 4	Time 5	Time 6	Time 7
Number of interviewees	2[b]	8[c]	5[b]	12[b]	4[b]	4[b]	32[c]
Schedule utilized	I	I	I	II	III	III (Revised)	III (Revised)
Section	(A,B)	(A,B)	(A,B)	(C,D)	(A,B,C,D)	(A',B',C',D')	(A',B',C',D')
Number of school districts visited	1	4	2	12	1	1	32
Organization of interviewee's classroom: single or multiple grades	Single	Single	Multiple	Single and Multiple	Single and Multiple	Single and Multiple	Single and Multiple
Teaching organization of Interviewees:[d] self-contained or team teachers	S	S	T	S/T/D	S	S	S/T/D

[a] Time 1, 2 and 3 are associated with Phase A; Time 4, 5 and 6 with Phase B, and Time 7 with Phase C as given in Foldout A.

[b] Primarily for testing and refining interview procedure and schedules.

[c] Primarily for data analysis.

[d] S = self-contained; T = team teachers; D = departmental.

each series of trial interviews, the results were evaluated and revisions were made in both the substance of the schedule and the interviewers' approach and procedures. As shown in Table 5.1, the final schedule was pre-tested and refinements made before the final series of interviewing was undertaken. Each of the three major interview schedules is reproduced in Appendix A.

Defining the general character of interviews. To achieve the project objective, three decisions were made concerning the general character of interviewing operations. The first of these decisions was that two people, one of them an experienced elementary teacher, should conduct the interviews. The reason for this decision was that a tandem interview would provide a setting and atmosphere in which the interviewed teacher would be comfortable and relatively relaxed. As teachers tend to have a vernacular of the school and classroom not readily understood by non-teachers, discussion during the interview would be facilitated if one of the interviewers were a teacher. Therefore, discussions and the flow of communication would not be inhibited by misunderstandings.

The second decision was that the interview should involve a considerable length of time, approximately two hours. An initial period in the interview would be needed for explaining the project and answering questions posed by the teacher. The stimulation and direction of learning is not a subject which can be discussed in a few minutes, for the complexities of classroom teaching-learning processes are often bound closely to many factors, such as the characteristics of students, the experiences and competencies of the teacher, the curriculum, the school milieu,and the nature of the community. Consequently, it was expected that teachers would need time to reflect, to think, and to describe their views and experiences relevant to facilitating learning.

The third decision was that the interviewed teacher's discussion should be considered a professional contribution to research, and as such it should be made during professional hours. For this reason all interviews were to be conducted under the aegis of the school administrator and during school hours. This was accomplished by 1) visiting with a school administrator and describing the project to him and 2) arranging to interview a teacher during morning or afternoon school hours. The arrangement of interviews during school hours was made possible by providing funds to the district for hiring a substitute teacher who took over the duties and responsibilities of the teacher being interviewed.

Content of the interview. The duties and responsibilities of o teacher for facilitating learning were conceived as having two broad foci. One focus was the arrangement and management of teaching-learning behaviors and events; the other was the subject-matter area of the curriculum. These were conceived only as tools for initially mapping out the topics to be discussed during an interview. They in no way reflected theories obout the noture of teaching in the elementary school.

The schedules of the first trial interviews of the project were based on these two areas of focus. The initial interviews involved one hour of discussion obout how the interviewer arranged and managed the affairs of the classroom, and the second hour was devoted to the discussion of subject-matter areas. The actual interview schedule used is presented in Appendix A. Exomples of the questions contained in that first schedule are:

First Hour

a. Whot should a teacher do the first day and week of o school year?

b. Imagine a new teacher who is thinking about her first days in the classroom. What are the things she needs to consider seriously and be certain of doing?

c. How do you go about getting to know your pupils?

Second Hour

a. Reading: Do you follow the textbook sequence exactly? How do your pupils use individual reading?

b. Science: What do you expect to study in science this year? Do you teach science the same or differently from other subjects?

c. Language: What do you use for a guide in language teaching? Do you insist that what is tought in language be applied in other subjects?

Many of the questions on the first interview schedule were naive and poorly stated. As the interviewers gained experience and skill, revisions and improvements were made. As noted in Toble 5.1, several modifications were made, and various schedules were designed and tested.

As the developmental studies proceeded, it became obvious that even a two-hour interview was inadequate for covering the discussions which teachers considered relevant to facilitating learning. It wos therefore necessary to define several schedules, each of which dealt only with one broad area of classroom teaching and learning. Four one-hour schedules were finally devised and used in the major data-gathering operations of Phase C, described in the Research Triptych, Chapter 2. The four schedules were:

a. Organization of Typical School Days,

b. Subject Matter and Curriculum,

c. Long-range Classroom Goals, and

d. Teaching and Learning Problems.

Schedule B, Subject Matter and Curriculum, is presented in Table 5.2, and the complete set of schedules is given in Appendix A. As these schedules indicate, the interviewers required only a small set of major topics for conducting interviews. This was due to the enthusiasm with which the interviewed teachers discussed the topics, the involvement they experienced in discussing professional problems without feeling that they were being evaluated. The interviewers found that a small number of leading questions were adequate to initiate and maintain discussion. Five general probes were used by the interviewers:

a. Can you give an example? Can you give another example?

b. Would you describe in more detail?

c. Could you describe why you did that?

d. What happened after that?

e. What did you do?

Posing these questions to the interviewee maintained a steady flow of discussion within the focus of the major schedule topics. A transcription of a ten-minute segment of an interview is given in Appendix C. The final design of the interview schedule and conditions of administration was based on detailed consideration of six facets of the general nature of the interviewing process. These six facets will be discussed below.

Facets of the Interview Process

The series of pilot studies provided an opportunity to experiment with six facets of the interviewing process:

1. Establishing an interview climate,

2. Preparing the teacher for the interview,

3. Focusing a free-response interview,

4. Establishing an appropriate psychological set,

5. Obtaining depth in discussion, and

6. Terminating the interview.

Consideration of these facets was focused on devising an interview procedure which would allow the interviewed teacher 1) to discuss what he considered significant, 2) to elaborate at any time on

TABLE 5.2

EXAMPLE OF FINAL INTERVIEW SCHEDULES

Schedule B: Subject Matter and Curriculum

Levels of Questions Posed By Interviewers		
Level 1: Major, initial stimulus inquiries concerning the main topic	**Level 2:** Illustrative ideas for use in stimulating further discussion	**Level 3:** Examples of topical terms sometimes used in initiating very detailed discussion
1. Would you describe how you conducted your reading class this morning?	Teacher style or pattern organization	Grouping whole class
a. Would you describe other techniques or patterns you have used?	Motivation Instructional procedure Evaluation Teaching facts, concepts, skills, types of thinking	Testing Grading
b. What techniques have you used in teaching this subject that have proved helpful in facilitating pupil learning?	Special techniques for learning	Grouping Individualized work Remedial Open-end experiences for widening horizons Creative experience
c. If you find you have to re-teach, what techniques do you use?		
d. How do you provide day-to-day continuity in this lesson?	From day-to-day Within o class period	Reviewing
e. Do you find it possible to help your pupils relate this subject to their other classes or interests?	With special classes With world outside school	
f. What audio-visual aids are you able to use with this subject?	Follow-ups	
g. How do you use your manuals and guides to aid you in preparing your lessons?	Subservience or choice	Preparations Use during class Work taken directly Work taken but modified Special techniques
2. Continue above pattern through remaining subject areas: Arithmetic Spelling Language Science Social Studies Handwriting		

oreas of discussion, and 3) to report upon specific behoviors and events.

Establishing on interview climate. Considerotion was given to two factors in estoblishing on interview climate: 1) minimizing disruptions, ond 2) locoting the interview in natural surroundings for the respondent. To accomplish these considerations, orrangements were made for the interviewed teacher to be released from teaching responsibilities for the interview period, ond the interview was held in the teacher's own school building. The latter decision was prompted by interview trials which suggested thot teachers participated in o more task-oriented monner in their own school than they did ot o less business-like locotion.

Preparing the teacher for the interview. For the type of interview used in this project, it is extremely importont to put the interviewee ot his ease ond to make clear thot the purpose of the interview is research, ond not the evoluation of his competencies. The interviewee was first assured of his cnonymity, to make him feel free to discuss ony of his ideas, whether he considered them "good" or "bad." It wos olso exploined thot the information desired was thot which reflected the realities of teaching. Eoch respondent wos then given information about the research project; he was told whot the research was designed to accomplish, how it was funded, who was conducting the project, and whot wos to be done with the informotion gothered.

The necessity ond odvantoges of tope-recording the conversotion were discussed, ond the interview sequences were stipuloted. At this point the tope recorder was turned on, ond the remainder of the interview preporotion wos recorded; this enobled the respondent to become occustomed to its presence ond operation. Eoch respondent wos then ossured thot o substitute teacher hod been provided from project funds to insure the well-being of his closs without plocing o burden on the school system. Care was taken to extinguish ony preconceived expectotionof set which the teacher might have held. It was stressed that the questions were very general, that there were no right or wrong answers, ond thot the purpose wos not to evoluate but to gother ideas obout the facilitotion of learning. Eoch respondent wos then informed that he could contribute most meaningfully by reloting his own ideas. The respondent was then mode oware that his answers would contribute to knowledge obout teaching.

As o final facet of the preporatory procedure, coch teacher wos osked several "warm-up" questi s. This served the functions of ollowing the teacher to become accustomed to doing most of the talking and of reinforcing the idea that the interviewers were interested in the respondent personally.

Focusing a free-response interview. As pointed out by Richardson, et al. (1964), the crucial dimension for characterizing interview approaches is directiveness--the degree of control exercised by the interviewer over the topic and the interviewee. Richardson, et al., discuss the concept of directiveness in four major points:

1. Directiveness can be meaningfully used to describe the interview as a whole when effective interpersonal communication seems to necessitate considerable variability of directiveness at various times, for varying purposes.

2. Directiveness denotes unpleasantness; the connotation is that directive interviewing is almost synonymous with legally enforced cross-examination.

   This assumption is called into question by interviewers such as Kinsey (1948), who used a very direct approach and a highly standardized interview schedule and yet seemingly got excellent cooperation from respondents.

3. Nondirective interviewing performance leads to a feeling of warmth and empathic understanding between interviewer and respondent, which facilitates the establishment of rapport.

   This is only true if all individuals have a health tolerance for ambiguity, an assumption which is not commensurate with the concept of individual differences. It is more common to observe an interviewer adjusting the degree of directiveness in reaction to the respondent's implicit or explicit demands for structure.

4. Interviewers must not be a source of bias in the interview.

   If this assumption is accepted, then one must rely heavily on directiveness in devising an interview schedule, since the degree of directiveness seems to be related to the possible sources of bias. At the same time, the degree of directiveness is assumed to be inversely related to the amount of information which can be expected from a given unit of the interview, except in cases where an exhaustive list of questions can be predetermined.

Since the purpose of the interview in the present study was to find out how teachers think about the facilitation of learning, two criteria for the adequacy of the interview schedule were deemed crucial:

1. Can a range of ideas be obtained which is representative of the total universe of relevant ideas?

2. Can teachers be sufficiently definitive in speaking of these ideas to demonstrate that the information is functional and operational, rather than theoretical and conjectural?

While the early schedules were mixtures of directive and nondirective approaches, they evolved into what can be described as a "funneling" approach. A broad area was introduced, and the respondent was permitted to discuss whatever aspects were significant to him. The interviewers limited their involvement to listening, asking for clarification, or asking for rephrasing or for restructuring when it seemed desirable. The second phase of funneling involved leading the respondent to the statement of illustrative ideas and asking for elaboration of various points. The third phase was to discuss specific points with the teacher, and to ask for examples from the operational context.

The term "funneling" is visually descriptive of the process, in that the procedure began with open-ended questions and then narrowed the focus to more specific aspects. The procedure is repeated for as many areas as the interview is intended to cover. This approach to interviewing effectively spans the entire continuum from non-directive to directive and achieves breadth and depth of coverage.

Establishing an appropriate psychological set. A psychological set is defined as "a temporary condition of the person that facilitates certain activities or responses rather than others," (English and English, 1958). The set desired was one of participation in the task of providing all possible ideas regarding the facilitation of children's learning. To create such a set, however, it was necessary for the interviewers to be cognizant at all times of a number of factors which could influence the respondents' participation. Proceeding on the premise that an interview involves individuals functioning in a social context, Richardson, et al. (1964) have enumerated such factors as a series of questions:

1. What are some of the inherent characteristics of the respondents that may make the interview a rewarding experience for them, and how can these characteristics be tapped?
2. How may the previous experiences of the respondents influence their perceptions of the interviewer and the interview? Have they had any previous experiences with research or with interviewing and, if so, was it positive or negative? May respondents believe that they will gain some tangible reward from the interviewer? With what kinds of people may they associate the interviewer? Is there a customary mode of interpersonal relations which is congenial to the respondents, and how should this influence the interviewer's plans and tactics? Do respondents appear to be more task or socially oriented?
3. Are there personal circumstances for the respondents that may influence their participation? If so, which of these are periodic and predictable, and which are idiosyncratic? How may the setting of the interview influence respondent participation?

4. What demands will the interview make on the respondents in terms of time and subject matter, and how may these demands affect participation?

5. How much communication is there in the social milieu of the respondents? If there is communication, what may respondents learn about the interviewer and the study before being interviewed? How may the influence of others affect any one respondent's participation?

6. How visible is the interviewer in the respondent's environment, and how and to what extent will his activities when not interviewing influence respondent participation?

It is apparent that such questions can be only partially answered prior to actual trial interviews. Therefore, the interviewers' cognizance of these factors, their adequate sensitivity to the respondents' individual characteristics, and their flexibility in constantly adjusting to the demands of the situation were deemed important.

It was found that care in preparing for the interview resolved a number of

the nature of the social context, the role structure within it, the nature of the task at hand, and the manner in which that task was to be accomplished. The emphasis placed on the confidentiality of the interview tended to free the teachers from apprehensiveness about the power structure of the institution. It was also stressed that the task was not intrinsically bound to the school of the teacher but was a mutual undertaking between the teacher and the interviewers on a larger, extrinsic project.

In addition, it was emphasized that one interviewer was a practicing teacher who was thoroughly familiar with the affairs of schools and classrooms. This interviewer attempted throughout the interview to maintain the role of a colleague in order to maximize the possibility of rapport between herself and the respondent. The teacher-interviewer also acted as a liaison between the respondent and the researcher-interviewer since the latter maintained the role of researcher for the purpose of task orientation.

Contrary to many interview situations in which the respondents have indicated displeasure over the demands made upon their time and effort, most of the respondents were pleased to be interviewed. This feeling of pleasure and importance was reinforced by the provision of substitute teachers, by the attentiveness of both interviewers, and by the fact that the point of the inquiry was concerned with the facilitation of learning. That the interviews were satisfying to the teachers is supported by their expressions of gratification. They indicated that they had been stimulated, that they had been helped to clarify their ideas about teaching, and that they had derived pleasure from ventilating certain feelings. As one teacher put it, "Why, it's just like having been to a psychiatrist!"

Obtaining depth in discussions. The content coverage of an interview is influenced by the nature of the interviewing process. In the section dealing with the interview approach, the method for obtaining adequate coverage was described as "funneling." Breadth of interview discussion was achieved by introducing a major area--for example, reading--and by asking the interviewee to talk about how he facilitated learning in that area. The interviewers focused on intent listening but occasionally requested clarification and interpretation. Depth of discussion was obtained by asking the interviewee to illustrate his ideas with classroom incidents and with particular problems which he might have experienced.

After a number of trial interviews it became apparent that if teachers were allowed to respond in generalities, they would respond as representatives of the teaching profession, and discussion would become theoretical rambling rather than empirical description. The requests for specific examples kept the discussion rooted in the reality of the teacher's own experience.

Terminating the interview. An attempt was made to find a natural termination point at which both the interviewers and the respondent could feel that the interview was over. This would generally come when the broad areas in the interview schedule had been covered and the teacher felt he had given the majority of examples he was immediately able to recall. While an interview does not have the undetermined duration of purely social interactions, it cannot simply be ended at that point where the interviewer has received the information he set out to elicit. Basic courtesy demands that the social aspects of the relationship be observed with the same care in termination as they were in preparation. The interviewer arranged the interaction and helped the respondent to create a set toward the investment of time and of himself; he thereby tacitly accepted the responsibility for the respondent leaving the experience with a sense of satisfaction and personal ease. When respondents seemed to require somewhat extended social interaction in phasing out, such interaction was extended. Beyond this responsibility to the individual, there are two reasons for such care in termination. First, had the respondents left the interview with feelings of dissatisfaction and uneasiness, they might have conveyed these feelings to others who were to be interviewed, thereby creating a negative set among future respondents. Second, had the respondents left with negative feelings, such information would certainly have been conveyed to the administrators who had granted initial access into the schools, and future possibilities to conduct research in those districts would have been jeopardized.

The interviewers were sensitive to these considerations, and no difficulty was experienced in arriving at natural termination points. The post-interview comments of the teachers included no negative expressions, and many of the teachers indicated that they had derived professional satisfaction from the experience.

b. CONTENT SUMMARIZATION OF INTERVIEW RECORDINGS

The substance of teachers' views concerning the facilitation of learning was defined in Chapter 1 as consisting of content units and percepts. In this section the procedures are discussed for producing content units from the recorded materials obtained by interviewing. The development of the content summarization procedures was carried out during Phase B of the project (see the Research Triptych in Chapter 2).

Purpose of Summarizing the Recorded Interviews

Interviewing teachers resulted in tape-recordings of the teachers' verbalizations of their perceptions and cognitions regarding the facilitation of learning; and these provided a rich source of material concerning a wide variety of classroom behaviors and events. However, due to the free-response nature of the interview, the recorded material could not be directly transcribed into a written form which would provide an orderly summary of the teachers' statements which the teachers considered relevant to the project objective. Interview discussion was often repetitive, as the teacher frequently expressed the same viewpoint in various ways using only slightly different words and phrases. Too, the interviewed teachers were not required to describe their views in a continuous stream of thought. As a result, procedures were needed for summarizing the recorded material in a manner which preserved the nuances of the views of the interviewed teachers.

The basic goal of summarizing the interview recordings was to reduce the statements of interviewed teachers in a manner which would retain the teachers' views in an authentic representation of their many modes of discussion. Without such reduction, it would have been impossible to display or to study a single teacher's views or the views of several teachers.

Various methods exist for summarizing interview recordings. Conventional content-analytic procedures suggest that a set of categories can be defined and used to tabulate the frequencies with which teachers described various kinds of classroom behaviors and events. This could have been done by deriving

a set of categories from topics listed in the interview schedules. Such a procedure would have tended to systematize the interviewees' discussions strictly in terms of the interview topics. However, these topics would have been established only to stimulate discussion, and they would have represented the logic of researchers rather than that of teachers. A priori definition of categories also makes it difficult to deal with statements which do not clearly belong in one of the pre-established categories. An alternative procedure for establishing content categories of this kind might have been to survey extant knowledge about teaching to logically define an exhaustive set of categories. An extensive literature about the processes of teaching does exist, but little information seems to be available on teachers' views of classroom behaviors and events.

Success in these procedures would have depended on formulation of an exhaustive and mutually exclusive set of categories. It would also have required an extensive knowledge of the content domain being investigated. Since the researchers wished to minimize the extent to which non-teacher sources of thinking determined the representation of teachers' views, a different approach to the summarization of interviews was developed.

These new procedures for summarizing interview recordings were developed on the basis of the project objective and the nature of the research problem as described in Chapter 1. These considerations, combined with difficulty of transcribing recordings and the need for relatively standardized procedures, suggested four guidelines:

1) Summarization of the recorded interviews should involve listening to the recordings and summarizing, in writing, statements of the interviewee.
2) Interviews should be summarized by teachers.
3) Summaries should focus on the interviewees' statements about behaviors and events which they expressed as being relevant to facilitating learning.
4) Transcribing interviewees' discussions into descriptive units should involve selecting statements which contained a single unit of classroom-relevant behavior (including thinking) or event as reported by the interviewed teacher.

These guidelines will be discussed in the following paragraphs.

Summarization by listening and writing. Direct transcription of recorded interviews into written form assumes that every element contained in each recording is of importance to the research. Even if literal transcriptions are made, they must be reduced at some later stage if the material is to be analyzed empirically.

For this reason the investigators decided that the summarization process should be performed on the tape-recorded material by a listening and writing procedure. Summaries obtained in this way would allow a selective extraction of the relevant statements which could, if necessary, be compared with the original source material. Operationally, this process would require the preparation of standardized content analysis procedure, employing the use of:

a) a set of directions,

b) appropriate pencil and paper materials,

c) play-back equipment, and

d) listeners trained in the necessary techniques.

The ways in which these resources were used are described in detail in Appendix D and are outlined in the discussion below.

Use of teachers for summarization. The goal of the summarization process was the written expression of the interviewed teachers' statements concerning facilitating learning. It has been repeatedly emphasized that the interview procedure was selected to allow the teacher freedom to select the kinds of behaviors and events he would describe, to form the manner of descriptions, and to express the relevance of a behavior or event for facilitating learning. Thus, any summarization made by a person other than the interviewed teacher would threaten the authenticity of the interviewees' expression of his own thoughts in his own words. It was a practical impossibility for interviewees to summarize their own discussions. A reasonable substitute seemed to be to employ other teachers to make the summaries. The use of other teachers would, to some degree, preserve the modes of thought characterizing teachers.

Teachers employed to summarize interviews were called judges. Their basic task was to listen to the interview recording and to write the statements of the interviewees concerning classroom-relevant behaviors and events. The use of teacher-judges seemed to imply a minimum need for orientation and training in the process of summarization, for a teacher-judge would find it easy to follow and understand the discussion because of his familiarity with the vernacular of the classroom and the modes of thought characteristic of teachers.

Central focus of summarization. The central focus of summarization, the writing of statements made by interviewees concerning classroom-relevant behaviors and events, implied some selection among the interviewees' statements. For example, topics which were considered irrelevant to the research

were excluded, unless an interviewee suggested how such affairs were related to the facilitation of learning. The function of the teacher-judge was to write down the pertinent statements of the interviewee. Comprehension of the interviewee's total train of thought was important for this process, for the focus of his statements was often to be found in the way he had previously talked about a particular topic, behavior, or event.

Definition of content units for summarization. Not all interviews were uniform, either with respect to the amount of discussion given to a particular topic or to the order in which content areas were covered. For the summarization to produce a uniform written record of interviewee statements, a procedure was needed which would provide comparability of statements made by several interviewees. This implied that a summary unit should be established which would allow the written recording of a wide variety of interviewee statements, but which would provide standardization in selecting and transcribing recorded material. Several techniques exist for defining units of observation with recorded materials.[1] One such technique involves the use of standardized time segments: a judge writes down the statements made by an interviewee during a certain time interval. In a variation of this technique, a random selection interview period is transcribed and summarized. A different technique is to specify key words for which the judge listens and then reports the interview statements which included the specified words. Both of these techniques call for the use of criteria external to the interview process, and thus they were considered unsuitable in terms of the project objective.

A unit of summarization was needed which was based on the intrinsic characteristics of the interviewand which had the following characteristics.

a) Intrinsic unity in terms of the interviewee's mode of thought,

b) Molar rather than molecular reference to classroom-relevant behaviors and events,

c) Directness or purposiveness in terms of the interviewee's views concerning facilitating learning, and

d) Amenability to manipulation and experimental study.

In general, the content should be the smallest meaningful representation of the interviewee's ways of expressing his own thoughts.

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[1] See for example, G. Lindzey (Ed.) Handbook of Social Psychology, 1954; or R. G. Barker and H. F. Wright, The Midwest and Its Children, 1956.

From various efforts at defining a content unit a definition was derived which was practical and meaningful to teacher-judges: units should be constructed in terms of an interviewee's classroom-relevant actions, implied actions, or the reasons for those actions. A report form for judges was prepared in the following format:

This teacher _____	because _____
_____	_____
_____	_____
_____	_____

Summarizing the interviewee's discussion with this format allowed the judge to report statements of various lengths and also to provide relative uniformity in summarization across several interviewees. Further discussion of the process of content unit preparation is given below, and details of the procedures are given in Appendix D.

Judgments of Content Units

A major consideration in applying the judging procedures was that of ensuring sufficient coverage of the recorded discussions. Due to the selection process used in listening and writing, a certain loss of information might occur in terms of the recorded discussion. A problem of this kind may be solved either by increasing the number of judges who summarized the same recording or by training one judge to summarize a recording. An advantage of using two or more judges is that the source material is filtered through more than one mode of thinking. This leads to an increase in coverage of the recording while keeping the amount of training at a minimum. A disadvantage is that multiple reports result. This would call for another step in the summarizing interview to produce a single set of content units for each recording

The procedure finally developed for summarizing interviews was a compromise of these alternatives. Two judges summarized each interview; and a third teacher compared both reports, while listening to the recording, to integrate the two into a single summarization. The procedures followed by this third teacher were called blocking and are described later. The use of two judges reduced costs while increasing the percentage of information extracted from the interview. Reliability of the judging process was not of great importance because consensus was not critical. Accurate representation of the content domain was of paramount importance, so a check was made early in the pro-

ject in order to evaluate the number of unique and common content units from three judges. A probability analysis suggested that one Judge extracts approximately 75% of the possible content units, two judges extract approximately 87%, and three judges extract about 94% of the possible units. The mechanical process of judging was finalized as a cycle involving five steps:

1) Listening to a brief section of the taped interview,
2) Stopping the recorder,
3) Rewinding the tape for checking as often as necessary the words of the interviewee,
4) Writing down the descriptive unit of the interviewee's statement in the two parts of a) action or implied action, and b) the reason, and
5) Starting the recorder again and recycling through the first four steps.

Teachers were hired to summarize the recordings. After training, two were assigned to each interview recording. The training session included four steps, which are presented in detail in Appendix D:

1) Describing and discussing the entire project,
2) Providing a set of judging materials which included
   a) instructions,
   b) short tape-recording for practice,
   c) judging report forms,
   d) tape recorder and accessories
   e) office supplies, and
   f) assignment sheet which identified the recording to be summarized,
3) Tutoring each judge in an individual practice session, and
4) Reviewing the purposes and procedures of the summarization process.

A training session usually required an hour. During this time, the instructor was able to talk individually with each judge and to check his trial summaries for consistency with the goals of summarization. The teachers who acted as judges frequently reported that the task was meaningful, that it provided insights into the way in which the interviewed teacher approached his duties and responsibilities. Further observations concerning the experiences and performances of judges are presented in Chapter 10. An example of content units prepared by the judges is presented in Figure 5.1. The relationship between a judge's report and the literal transcription of the interview recording is also given in Chapter 11.

Judge No. 4

Teacher No. 9504

No.		No.	
4	This teacher never tells student the right answer	___	because
5	This teacher asks them questions which would lead them into right line of thinking, so he would get his own answers	___	because
6	This teacher believes the first three grades of school are important.	___	because they set the pace for all his goals
7	This teacher believes that if a child don't read and read well he's just out.	___	because reading goes along with listening and everything they do.

Figure 5.1 A judge's report of an interview

Blocking of Judged Content Units

Summarization of a teacher's views required that judges edit each recording according to the procedures outlined above. Thus, for each interviewed teacher, two lists of content unit descriptions were available as input for later stages in the analytic process. However, it would have been inefficient and difficult to manipulate both lists simultaneously. Therefore, a procedure was needed which would combine the two lists into one set of content units for each interviewed teacher. The procedure for combining the two lists of content units should omit redundancies but retain content units unique to each judge. Such a procedure would represent the interview content more economically than would a procedure which simply pooled both summaries without deleting redundancies.

The procedure developed for combining two judges' summaries was called blocking. Blocking required a third person to identify common and unique units of judge's reports. Any one of several procedures could have been used for blocking the units produced by the judges. In one procedure, one of the two judges' reports would have been defined as a criterion, and the other judge's report would be compared with the criterion list. Another procedure would have been to weigh both judges' reports equally and to check for similar and dissimilar content units. In terms of the project objective, it seemed most reasonable to regard the interview recording as the criterion and to compare both judges' reports with the statements made by the interviewee. Defined in this way, the blocking procedure was essentially a judging process. It proceeded according to four guidelines:

1. Teachers should perform the blocking operation to reduce the possibility of researcher bias.
2. The central focus of the blocking operation should be the retention of all content units which are relevant to the facilitation of learning.
3. The blocking operation should result in a single set of content units for each interviewee.

The implications of these guidelines were essentially the same as those for the judging process. The listening and writing process would be an efficient and effective way of selecting the pertinent statements of interviewed teachers.

These guidelines indicate that the general character of blocking was basically the same as that of judging. Blocking, however, differed significantly in three respects: 1) the blocker used a dictating machine for recording the selected content units, thus reducing the amount of time necessary, 2) the blocker merged the action and reason parts of a judge's reporting units to formulate a content unit, and 3) a locker was instructed to formulate additional content units as necessary.

The blocker was instructed to follow a sequence of seven steps:

1) Listen to a small section of the taped interview.
2) Stop the recorder.
3) Compare the two judges' reports.
4) Rewind the tape, if necessary, for clearer understanding of the interviewee's words.
5) Dictate the common and unique statements written by the judges.
6) Add additional content units which clearly had not been reported by either judge.
7) Start the recorder again and recycle steps 1 through 6.

The blocking procedures were finalized after several pilot efforts. Teachers were hired for the purpose of performing the blocking operations. The blockers were trained and then assigned to particular interview recordings and to the corresponding judges' reports. The training session included the following steps, which are presented in detail in Appendix E:

1) Describing and discussing the entire project;
2) Providing of a set of blocking materials, including
    a) instructions,
    b) practice tape-recording,
    c) judging report forms,
    d) tape-recording and dictating equipment and accessories
    e) office supplies, and
    f) assignment sheet, identifying the interview recordings to be summarized;
3) Tutoring each blocker in an individual practice session; and
4) Reviewing the purposes and procedures of the blocking process.

A training session usually required an hour. During this time the instructor was able to talk individually with each blocker and to check his trial work for consistency with the goals of blocking. It was suggested to the blockers that before actually beginning they might orient themselves to the interview by listening to 5 or 10 minutes of the tape recording. Like the judges, the blockers commented on the meaningfulness of the task and on the insights it provided. Further observations on the performance of blockers are reported in Chapter 10.

c. SAMPLING TEACHERS

The procedures for interviewing teachers and performing content analysis were designed and implemented to provide manipulable units of content. The resulting set of units was the empirical representation of the substance of teacher viewpoints. The units were also the constituted material to be used in the subsequent examinations of the structure of viewpoints.

In an earlier chapter it was posited that an important aspect of the project was its teacher-relevance. That is, every phase of the study of substance and structure of teacher viewpoints should involve practicing elementary teachers. An early problem was to determine the way in which teachers should be selected to participate in the various phases of the study. Teacher selection was critically important at two points in the study. The first of these was sampling teacher-interviewees for the purpose of eliciting substance, and the second major point was sampling teacher-sorters for the purpose of identifying structure.

Early in the history of the project, then, it was apparent that there would be a continuing need for a rational and efficient system for sampling teachers. The Research Triptych in Chapter 2 illustrates that the development of a sampling scheme was the first major methodological undertaking initiated after the specification of research objectives. Because of certain basic characteristics of the problem of sampling teachers, developing procedures become something of a major undertaking and the teacher sampling scheme was not completely operational until the beginning of Phase C. Thus, the development of sampling procedures, shown as a component of Phase A, was chronologically one of the major developments of Phase B.

The sampling methods are presented briefly here, and discussion is limited to the applicability of the sampling system to the study of teacher viewpoints. A complete description of the methodology is available as a seporate report entitled Multivariate Procedures for Stratifying School Districts (Miller, 1967).

Procedures for sampling teachers are associated with four problem areas. They are 1) defining the teacher population, 2) identifying members of the population, 3) establishing a sampling system, and 4) drawing samples of teachers.

Defining the Teacher Population

The first step was to define either a conceptual or an actual population of teachers with which the research would be concerned. Because it is difficult to draw samples from conceptual populations, an early decision was to define an actual, or tangible, population. Two research objectives influenced the definition of the population. First, it was desired that the population be as homogeneous as possible with respect to the nature of the teachers' interactions with children. Theoretically, all derived content units should represent the same conceptual domain, and units should have the same general meaning for all the individuals in a sample of teachers. For this to be true, a necessary condition was that the population be composed of persons who were similar with respect to teaching-relevant experimental background. Therefore, it was determined that only elementary teachers should be included in the population because secondary school teachers operate in a different organizational context and secondary student learning problems may be quite different from those of elementary students, from a teacher's viewpoint.

The second research objective influential in the definition of the population was that the population should include as many teachers as practical, given the prior condition that it should be an all elementary population. An early, tentative solution to the problem of delineating the boundaries of the population was to include all teachers who taught in schools within a certain radius of the Madison campus of the University of Wisconsin.

This arbitrary geographic definition was found to be unacceptable, because the population thus described might have been a biased representation of "teachers-in-general." The problem of potential bias was a serious one for both the elicitation of substance and the investigation of structure of teacher viewpoints. If a sub-group of teachers were inadvertently omitted from the population, a correspondingly important class of teacher perceptions might never be detected. If a sub-group of teachers were not to be represented in the sample chosen for the study of structure, some potentially important subtle differentiations of substance might never be made.

There was an important concern, then, that the population and samples drawn from it be unbiased representations of "elementary-teachers-in-general." This concern carried procedural implications for defining the population and for drawing the samples. The implication for defining the sample was that the largest possible number of elementary teachers be included. The implication for sampling was that teachers be selected according to a rigorous random or stratified sampling plan.

The estimate of the largest group of teachers which could be specified as the population for study was revised to include all the elementary school teachers in the state of Wisconsin. To have included teachers from other states would have exceeded the resources available for the research.

Identifying Members of the Population

After the research population had been defined as including all elementary teachers in Wisconsin, it was necessary before samples could be drawn to find a way to identify individual teachers.

In Wisconsin, every school is required to submit to the Wisconsin State Department of Public Instruction (WSDPI) a record of certain information about teachers. This is stored on a magnetic tape, called the Teacher Tape, and includes teachers' names, their division of time between elementary and secondary duties, whether they were employed full-time or part-time, the grades or subjects they taught, and whether any of their time was assigned to professional duties other than teaching. In order to develop an exact operational definition of "elementary teachers in Wisconsin," this information was obtained and analyzed. It is summarized here in Table 5.3, which has three sections. The top section gives frequency distributions for all Wisconsin teachers who were listed with the WSDPI as having duties which were 100% elementary teaching; the center section gives the same summary information for teachers whose responsibilities were 100% in junior high schools; and the lower section provides information on teachers whose responsibilities were divided between the elementary and junior high school levels. Any teacher who

TABLE 5.3

NATURE OF TEACHING DUTIES AND PROPORTION OF TIME SPENT TEACHING FOR WISCONSIN ELEMENTARY SCHOOL TEACHERS. (N = 24,268)

Elementary School Teachers Only (n = 19,877)

*Category on Teaching	Percentage of time spent teaching							
	0	1-20	21-40	41-60	61-80	81-99	100	Totals
1	0	0	0	1	0	0	0	1
2	60	4	11	183	0	0	16,056	16,314
3	50	212	288	369	123	83	1,681	2,806
3, 1	0	0	0	0	0	0	1	1
3, 2	0	0	1	5	1	4	82	93
4	13	34	24	21	12	2		273
4, 2	0	1	3	2	5	2		59
4, 3	11	92	70	40	11	4	28	256
4, 3, 2	0	1	1	0	1	0	4	7
Unspecified	0	1	1	1	0	0	58	61
Totals	134	345	399	622	153	95	18,123	19,871

Junior High School Teachers Only (n = 4,138)

	Percentage of time spent teaching							
	0	1-20	21-40	41-60	61-80	81-99	100	Totals
2	0	0	0	0	1	0		242
3	144	94	169	311	290	41	264	1,313
3, 2	2	0	1	5	9	0	10	27
4	495	11	174	168	157	32		2,097
4, 2	9	2	11	4	7	0		58
4, 3	65	34	42	48	49	12	135	385
4, 3, 2	0	0	2	0	3	0	1	6
Unspecified	4	0	1	1	2	0	2	10
Totals	719	247	400	537	528	85	1,632	4,138

Teachers in Both Elementary & Junior High Schools (n = 253)

	Percentage of time spent teaching							
	0	1-20	21-40	41-60	61-80	81-99	100	Totals
2	0	0	0	0	0	0		1
3	3	8	25	63	49	28	46	222
4	0	1	2	4	2	1		12
4, 3	0	3	4	6	2	1	1	17
Unspecified	1	0	0	0	0	0	0	1
Totals	4	12	31	73	53	30	50	253

Definitions of categories:

Category	Nature of Teaching Duties
1	Nursery school
2	Self-contained classroom, Grades 1-8
3	Non-academic subjects (e.g., Agriculture, Driver Education)
4	Academic subjects (e. g., Science, English, Health)

Many of the possible combinations of Categories 1, 2, 3 and 4 were null classes and are not entered in the above table.

was listed as having any high school responsibilities was not included in this investigation.

It is clear from Table 5.3 that a great predominance of Wisconsin teachers who were coded as elementary teachers were classified as "elementary only." Further, over 67% of these teachers taught in self-contained classrooms in grades 1-8. The 16,314 teachers of self-contained classrooms in grades 1-8 were selected as the operational target population for the study of viewpoints on teaching. This selection fulfilled the objectives of representing "elementary-teachers-in-general," of including as many teachers as possible, and of keeping the population relatively homogeneous with respect to the context of teacher-student interaction.

Any individual teacher from this population could be identified from the WSDPI Teacher Tape. By holding constant the codes for the appropriate levels of grades taught, subjects taught, and division of time, the researchers could obtain a complete list of the 16,314 teachers of the operational population could be easily obtained through the use of a computer. The list could also be readily organized according to educational administrative structure, so it was possible to classify the population of teachers in terms of the schools and districts for which they worked. These lists were the materials for sampling teachers during the remainder of the study.

Establishing a Sampling System

The algorithm for selecting samples of teachers would have to operate under two unusual circumstances: first, the exact population of respondents was known and quite large; second, the nature of the dependent variables, or characteristics to be studied, was not yet known. The sampling algorithm, then, would have to be efficient and unbiased and would have to be predicated upon some assumptions about the nature of the subsequent research.

The operational criterion of efficiency suggested that the teacher population be stratified along the lines of extant administrative structure, and the criterion of unbiasedness implied that random selection be employed at all points possible. The sampling plan which was developed and used throughout the project was, then, a sequential stratified random sampling plan. It was sequential because administrative structures (local districts) were sampled first, and then teachers were sampled from within the districts; districts were stratified according to a complex typology of elementary school districts in the state of Wisconsin; it was random at both sampling choice points, that is, the selection of districts from strata was random and teachers were randomly selected from the chosen districts.

Local districts were selected as the units to be stratified because they are the smallest structures in the public education hierarchy which have independent administrative integrity. Because of this, the district superintendents were to be the points of entre for gaining research access into the schools.

One important substantive problem was associated with the stratification of districts. The object of the study was the substance and structure of teacher viewpoints, and it would be an unnecessary exercise to use district-relevant stratifying dimensions for ultimate sampling of teachers unless there were significant correlations between those stratifying dimensions and the measures of substance and structure. These relationships were not known, of course; they could only be hypothesized. Despite this uncertainty about the true relationships between district stratifying variables and the dependent variables, the decision to stratify districts, rather than teachers, was retained on several grounds:

1. The hypothesis that characteristics of teachers are different between different types of districts,
2. The fact that more kinds of data were available for stratifying districts than for stratifying teachers,
3. The necessity of gaining entre to teachers through local district administration,
4. The knowledge that a stratified random sample has the characteristics of a simple random sample, even if there is no relationship between the stratifying variable and the dependent variable under study.

Thus, stratifying districts had the advantages of ensuring representation in the sample of a variety of administrative structures, of minimizing the probability of failing to observe certain segments of the content domain, and of increasing the probability of detecting subtle differentiations of those segments.

The decision to stratify districts generated the problem of building a methodology for stratification. Local school districts are complex structures which can be characterized in many ways, and many of these possible characterizations appeared to be relevant to the study of teacher viewpoints. Because this multivariate complexity was itself considered to be an important characteristic of local districts, it was determined that a multivariate stratification of the 725 Wisconsin elementary school districts should be developed. The procedures for preparing a multivariate system for stratifying districts may be trichotomized: selection of input data, derivation of stratifying dimensions, and definition of strata.

Selection of input data. It was decided that only information already gathered and filed would be used as input data. The WSDPI had three sources of information which contained data on school systems; they were called the "District /School Tape," the "Employee Tape," and the "Valuation Deck."

From these sources, 31 variables were selected or constructed to be used as raw input for the stratification algorithm. These variables are divided into four major categories: means of teacher-based variables, variances of teacher-based variables, district-based variables, and constructed or ratio variables. A list of these variables is given in Table 5.4. All 31 of the variables were measures of district characteristics.

Special manipulations were performed to derive district indices for three of the categories of variables: means of teacher-based variables, variances of teacher-based variables, and constructed variables. The mean value was computed for all the full-time elementary teachers in a district (for each of the six indicators which were available to describe those teachers). Thus each district had six teacher-characteristic scores which were the averages on its teachers. The logarithm of the variance of the values on each teacher characteristic was also computed for teachers-within-districts. Thus, each district had six teacher-characterizing scores which represented the variability of its teachers.

Five ratios of count variables and valuation variables were selected to be included as input variables. They were: Equalized Valuation per Student, Students per School, Students per Staff Member, Staff per School, and Equalized Valuation per School.

Derivation of stratifying dimensions. The identification of the exact population of districts and the exact set of variables defined an initial data matrix with dimensions 31(variables) by 725 (districts). The next step was to apply techniques for manipulating this array of data. Multivariate correlational techniques seemed most appropriate. The group of procedures known as component analyses seemed particularly well-suited, because they would permit the direct computations of scores for districts on the factors which they produced. Two analyses of this type were applied: principal components analysis and image analysis. Both techniques were used and compared.

TABLE 5.4

VARIABLES USED IN DISTRICT STRATIFICATION

Teacher-Based Variables (Means)

1. Average Highest Credential of Teachers in a District (Coded 1 for lowest ranked through 9 for highest ranked)
2. Average Highest Degree of Teachers in a District (Coded 1 for lowest ranked through 9 for highest ranked)
3. Average Salary of Teachers in a District
4. Average Local Experience of Teachers in a District
5. Average Total Experience of Teachers in a District
6. Average Number of Grades Taught by Teachers in a District

Teacher-Based Variables (Variances)

7. Log Variance of Highest Credentials of a District's Teachers
8. Log Variance of Highest Degrees of a District's Teachers
9. Log Variance of Salaries of a District's Teachers
10. Log Variance of Local Experience of a District's Teachers
11. Log Variance of Total Experience of a District's Teachers
12. Log Variance of Number of Grades Taught by each of a District's Teachers

District-Based Variables

13. Kind of School District Administration (Coded 1 for city type, 2 for county type)
14. Score of Grades in the District (Coded 1 for k-12, 2 for k-9)
15. Class of State Aid Granted the District (Coded 1 for Integrated, 2 for Intermediate, 3 for Basic)
16. Elementary Enrollment
17. Secondary Enrollment
18. Number of Full-Time Elementary Teachers
19. Number of Full-Time Elementary and Junior High School Teachers
20. Number of Full-Time Secondary School Teachers
21. Number of Elementary and Junior High School Teachers with Other Duties
22. Number of Non-Teaching Professional Staff
23. Number of One-Room Schools
24. Number of Two-Room Schools
25. Number of Schools with Three or More Rooms
26. Total Equalized Valuation within a District

Constructed Variables

27. Equalized Valuation per Student (26) ÷ (16 + 17)
28. Students per School (16 + 17) ÷ (23 + 24 + 25)
29. Students per Staff Member (16 + 17) ÷ (18 + 19 + 20 + 21 + 22)
30. Staff per School (18 + 19 + 20 + 21 + 22) ÷ (23 + 24 + 25)
31. Equalized Valuation per School (26) ÷ (23 + 24 + 25)

The computation of factor scores for either image analysis or principal components analysis required that every district have a score on every variable; that is, there could be no missing data. However, some data were missing from the initial data matrix. There were three causes of missing data. The main cause was that many rural districts had only one full-time elementary teacher. In such districts the variability of teacher characteristics could not be defined, and missing data resulted. Another cause was that some districts had more than one teacher, who had the same value on one or more of the teacher characteristics. Again, the log variance of such a teacher characteristic could not be defined. The third and least significant cause of missing data was that there were a few recording errors on some of the district records filed with the WSDPI.

Before the data matrix could be submitted to the multivariate analysis routines, some procedure had to be developed for estimating values to substitute into the missing data gaps. The procedure chosen for this purpose was one of multiple regression and had four basic steps. First, all districts were identified which had no missing da . Second, the multiple regression was computed between each of the twelve teacher-characterizing variables (where all missing data were concentrated) and the set of the 19 other variables, using the reduced sample of districts. The twelve regression equations (sets of beta weights) were also computed. Third, these regression equations were employed to "predict" values where there were missing data on the twelve teacher-characterizing variables for those districts which had data missing. Fourth, the substitute measures were inserted into the matrix in the proper places. This modified data array was called the Input Data Matrix.

The two multivariate analyses, image and principal components, proceeded from the matrix of intercorrelations among the 31 variables of the Input Data Matrix. Complete analyses were computed in both cases, so 31 principal component factors and 31 image factors were derived. Each set of factors was rotated to the varimax criterion (Kaiser, 1958). The two resulting sets of rotated factors were then compared for structural similarities, and the two sets of factors were intercorrelated. The results of the image analysis were more interpretable, so the factors from the image analysis were used in the stratification.

An incomplete rotated image factor matrix is given in Table 5.5.

Definition of strata. The six largest image factors were retained for use in constructing, interpreting, and using the stratification of Wisconsin elementary school districts. The major loadings for each of these factors are given in Table 5.6. The procedure of stratifying had four steps. First, the com-

TABLE 5.5

SIX LARGEST FACTORS FROM COMPLETE SET OF ROTATED IMAGE FACTORS OF THE DISTRICT STRATIFICATION INPUT DATA MATRIX [a]

Variable	1	2	3	4	5	6	SMC [b]
1	06	45	20	41	10	06	.55
2	12	56	22	28	14	01	.57
3	19	68	19	23	01	08	.73
4	08	22	23	57	05	00	.70
5	00	14	23	73	08	-02	.63
6	06	-52	-41	-15	00	-03	.60
7	05	31	59	14	15	12	.57
8	00	02	60	11	13	-05	.42
9	11	42	47	08	12	09	.55
10	12	38	55	48	10	00	.79
11	06	30	63	24	10	00	.70
12	01	-07	36	04	56	05	.55
13	-23	-32	-14	-11	-17	-11	.45
14	-11	-37	-45	-17	-27	18	.77
15	-10	-51	-51	-13	-23	13	.76
16	98	09	03	02	00	03	1.00
17	98	10	02	04	01	00	1.00
18	98	11	04	02	00	04	1.00
19	58	09	08	04	09	07	.55
20	98	09	01	03	00	00	1.00
21	96	13	05	04	05	-04	.99
22	96	14	07	03	00	00	.99
23	00	-11	11	01	60	02	.41
24	01	-02	05	08	49	-01	.29
25	93	15	09	04	08	03	.97
26	97	08	00	02	-01	-02	.99
27	-02	-14	-18	-05	-14	-18	.48
28	21	88	14	04	-15	06	.98
29	03	13	00	00	00	71	.56
30	18	89	14	04	-19	07	.98
31	19	80	04	06	-22	07	.83
SS [c]	830	484	286	161	135	69	

[a] Coefficients have been rounded to two places, and decimal points have been omitted.

[b] Squared multiple correlations

[c] Sum of Squares

TABLE 5.6

COMPOSITIONS OF FACTORS USED
TO STRATIFY ELEMENTARY SCHOOL DISTRICTS

Factor	Variable		Loading
1	16.	Elementary enrollment	.98
Numerical Size	17.	Secondary enrollment	.98
	18.	Number of full-time elementary teachers	.98
	20.	Number of full-time secondary teachers	.98
	26.	Total equalized valuation	.97
	21.	Number of elementary teachers with other duties	.96
	22.	Number of non-teaching professional staff	.96
	25.	Number of schools with three or more rooms	.93
	19.	Number of full-time elementary and junior high teachers	.58
2	30.	Staff per school	.89
Organizational	28.	Students per school	.88
Complexity	31.	Equalized valuation per school	.80
	3.	Average teacher salary	.68
	2.	Average highest degree of teachers	.56
	6.	Average number of grades taught by teachers	-.52
	15.	Class of state aid	-.51
	1.	Average highest credential of teachers	.45
3	11.	Log variance of teachers' total experience	.63
Teacher	8.	Log variance of teachers' highest degrees	.60
Variability	7.	Log variance of teachers' highest credentials	.59
	10.	Log variance of teachers' local experience	.55
	15.	Class of state aid	-.51
	9.	Log variance of teachers' salaries	.47
	14.	District grade scope	-.45
4	5.	Average total experience of teachers	.73
Teacher	4.	Average local experience of teachers	.57
Experience	10.	Log variance of teachers' local experience	.48
5	23.	Number of one-room schools	.63
School-Unit	12.	Log variance of grades taught by teachers	.56
Size	24.	Number of two-room schools	.49
6	29.	Students per staff	.71
Pupil-Teacher Ratio			

plete distributions of factor scores were computed for each of these six factors. Second, each of the six distributions of factor scores was dichotomized at its median. Third, each of the 725 districts was located and coded with respect to these six (now dichotomous) distributions. If a district's factor score was among those which were above the median, it was assigned a plus (+) for that factor. If it had a score below the median, it was assigned a minus (-) for the factor. Since there were six factors, each district was ultimately identified by its profile of six pluses and minuses.

The final step in forming strata was to group together all those districts with identical profiles. There were $2^6 = 64$ possible profiles, and the 725 districts were partitioned among the 64 corresponding categories. The strata were exhaustive and mutually exclusive.

Drawing Samples of Teachers

Each of the 64 patterns of pluses and minuses (on the dichotomized factor score distributions) defined a stratum of districts. Before a sample of teachers could be drawn, it was necessary to a) identify the individual districts which were in each stratum, b) integrate into the sampling system other important sampling variables, c) derive descriptions of the types of teachers needed for a representative sample, and d) identify individual teachers-within-districts who fit the defined pattern.

Identifying districts within strata. One stratum of the 64 was a null class; no district fit that particular pattern of 6 pluses and minuses. It was desirable to maintain the characteristic of independence among stratifying dimensions, while establishing a stratifying system which had no empty strata. To accomplish this, the 64 strata were collapsed into 32 strata through the use of a fractional factorial plan.[1] Each stratifier served as a factorial dimension with two levels, and the confounding relationship was $I = 123456$. Thus the revised sampling plan was a 1/2 fraction of the original (64 strata) plan. Factor 6 could be re-defined as either $6 = 12345$ (for one of the 1/2 fractions) or $6 = 12345$ (for the other 1/2 fraction). The second of these definitions was selected because it represented the fraction which had no null strata.

[1] A definition of fractional factorials and illustrations of their uses may be found in G. E. P. Box and J. S. Hunter, The 2^{K-P} Fractional Factorials, 1961.

Molding the district-sampling scheme into fractional factorial format had several advantages. The main advantage was that it provided an analytic framework for determining the relationships between the stratifying dimensions and dependent variables which would eventually be studied. Another advantage was that other stratifying variables, more directly relevant to teacher characteristics and research methods, could be added to the system at later dates. The interactions between the district-relevant stratifiers and other stratifiers could then be determined under appropriate experimental and analytic conditions. A third major advantage was that fractional factorials retain the characteristic of orthogonality among the independent factors which allows the researchers to determine in advance the pattern of factor confoundings.

The modified sampling scheme was a 2^{6-1} fractional factorial of the original, fully-crossed, six-factor plan, and it divided the 725 elementary districts into 32 strata. Each of these districts was identified with reference to its stratum membership. Project resources limited the sample of districts; therefore, to assure representation of all district types, one district was randomly drawn from each of the 32 strata. These 32 districts agreed to cooperate in research procedures, and their teachers were the respondents for both the major interview study and the major sorting study.

Integrating other sampling variables. In both major samples of teachers, it was desirable to control potential inter-teacher sources of variance as well as inter-district sources. In the major interview study, it was further necessary to control potential sources of variance arising from differences among the four interview schedules and from their sequential order.

To control sources of inter-teacher variation in the interview study, three teacher variables were combined with the 2^{6-1} fractional factorial of derived district variables. These three teacher variables were selected after examining the intercorrelations among the six teacher variables which could be obtained from the WSDPI. The intercorrelations of the six available teacher characteristics are given in Table 5.7.

There appeared to be three clusters of teacher characteristics. One cluster was comprised of Highest Credential, Highest Degree, and Salary; a second cluster included the two experience variables; and Span of Grades Taught was somewhat independent of the other five variables. It was decided to include one variable from each of these clusters in the teacher sampling scheme. The three variables chosen were

Highest Degree, Local Experience, and Span of Grades Taught. Highest Degree and Local Experience were selected from the first two clusters,because they had the lowest correlations with variables from other clusters; they therefore represented, by small margins, somewhat more independent sources of variance than the other variables from their respective clusters.

TABLE 5.7

INTERCORRELATIONS OF SIX TEACHER CHARACTERISTICS

Variable	1	2	3	4	5	6
1. Highest Credential	100	61	56	50	53	-49
2. Highest Degree		100	66	39	41	-48
3. Salary			100	39	32	-56
4. Local Experience				100	68	-34
5. Total Experience					100	-27
6. Span of Grades Taught						100

The last sources of variance to be controlled in the interview study were those related to the interview schedules. Four interview schedules had been constructed to elicit information relevant to four general content areas; the schedules were described in the first section of this chapter.

Each schedule required approximately one hour of administration time, and each interview lasted two hours; thus, each teacher was interviewed with two of the four schedules. Two effects due to interview schedule differences were to be controlled: differences among particular schedules and differences due to the order in which the teacher responded to his two schedules.

Control over particular schedules was provided by generating two dichotomous variables which were incorporated into the fractional factorial pattern. Each of these variables had two levels (+ and -) and all possible combinations of these levels defined four patterns: ++, +-, -+, and --. These patterns were assigned at random to represent the four schedules. The fractional factorial plan would accommodate only two pairs of schedules, and six pairs were possible. The two pairs which were selected for administration were 1) Schedules A and C, and 2) Schedules B and D. The schedules were matched into sets

on the basis of their content. Schedule A (Organization of Typical School Days) seemed more similar to Schedule B (Subject Matter and Curriculum) than to either of the other schedules. Likewise, Schedules C and D (Long-Range Classroom Goals and Teaching and Learning Problems) seemed relatively related in terms of content. To provide variation in content for each interviewee, the A-C and B-D pairings were established.

Once the procedure for assigning schedules had been established, it remained only to determine the order in which an interviewee would encounter his schedules. This was fixed by generating one last dichotomous variable in the fractional factorial framework. A plus on this variable meant that a teacher would be presented with the schedules in alphabetic order, and a minus meant that his schedules were presented in reverse alphabetic order.

The combination of the three types of variables--district, teacher, and interview schedule--amounted to a complex design for the major interview study. The complete specification of the combination of district type, interview schedules and sequence, and teacher type is represented as a double row of 12 pluses and minuses:

Variable	1	2	3	4	5	6	7	8	9	10	11	12
	-	+	+	+	+	+	-	+	-	-	-	+
	-	+	+	+	+	+	+	-	-	-	-	+
	District specification						Schedule and order specification			Teacher specification		

The complete design matrix for the major interview study is given in Table 5.8.

The design matrix for the major sorting study was similar to the matrix given in Table 5 8. The same six district characteristics were used ; in fact, as discussed earlier, the same 32 districts cooperated during both phases of the research. Again, three teacher characteristics were identified with dichotomous variables generated from the fractional factorial design. The three teacher characteristics which were dichotomized for selecting sorters were Highest Degree, Local Experience, and Grade Level. The two values for the Grade Level characteristic were Primary (grades 1, 2, and 3) and Intermediate (grades 4, 5, and 6).

TABLE 5.8

DESIGN MATRIX FOR MAJOR INTERVIEW STUDY

I = 123456

Variable											
1	2	3	4	5	6	7	8	9	10	11	12
-	-	-	-	-	+	-	-	+	+	+	+
-	-	-	-	-	+	+	+	+	+	+	+
-	-	-	-	+	-	-	-	-	-	-	-
-	-	-	-	+	-	+	+	-	-	-	-
-	-	-	+	-	-	-	+	+	-	-	-
-	-	-	+	-	-	+	-	+	-	-	-
-	-	-	+	+	+	-	+	-	+	+	+
-	-	-	+	+	+	+	-	-	+	+	+
-	-	+	-	-	-	-	+	-	+	-	-
-	-	+	-	-	-	+	-	-	+	-	-
-	-	+	-	+	+	-	+	+	-	+	+
-	-	+	-	+	+	+	-	+	-	+	+
-	-	+	+	-	+	-	-	-	-	+	+
-	-	+	+	-	+	+	+	-	-	+	+
-	-	+	+	+	-	-	-	+	+	-	-
-	-	+	+	+	-	+	+	+	+	-	-
-	+	-	-	-	-	-	+	-	-	+	-
-	+	-	-	-	-	+	-	-	-	+	-
-	+	-	-	+	+	-	+	+	+	-	+
-	+	-	-	+	+	+	-	+	+	-	+
-	+	-	+	-	+	-	-	-	+	-	+
-	+	-	+	-	+	+	+	-	+	-	+
-	+	-	+	+	-	-	-	+	-	+	-
-	+	-	+	+	-	+	+	+	-	+	-
-	+	+	-	-	+	-	-	+	-	-	+
-	+	+	-	-	+	+	+	+	-	-	+
-	+	+	-	+	-	-	-	-	+	+	-
-	+	+	-	+	-	+	+	-	+	+	-
-	+	+	+	-	-	-	+	+	+	+	-
-	+	+	+	-	-	+	-	+	+	+	-
-	+	+	+	+	+	-	+	-	-	-	+
-	+	+	+	+	+	-	-	-	-	-	+

Variable											
1	2	3	4	5	6	7	8	9	10	11	12
+	-	-	-	-	-	-	+	-	-	-	+
+	-	-	-	-	-	+	-	-	-	-	+
+	-	-	-	+	+	-	+	+	+	+	-
+	-	-	-	+	+	+	-	+	+	+	-
+	-	-	+	-	+	-	-	-	+	+	-
+	-	-	+	-	+	+	+	-	+	+	-
+	-	-	+	+	-	-	-	+	-	-	+
+	-	-	+	+	-	+	+	+	-	-	+
+	-	+	-	-	+	-	-	+	-	+	-
+	-	+	-	-	+	+	+	+	-	+	-
+	-	+	-	+	-	-	-	-	+	-	+
+	-	+	-	+	-	+	+	-	+	-	+
+	-	+	+	-	-	-	+	+	+	-	+
+	-	+	+	-	-	+	-	-	+	-	+
+	-	+	+	+	+	-	+	-	-	+	-
+	-	+	+	+	+	+	-	-	-	+	-
+	+	-	-	-	+	-	-	+	+	-	-
+	+	-	-	-	+	+	+	+	+	-	-
+	+	-	-	+	-	-	-	-	-	+	+
+	+	-	-	+	-	+	+	-	+	+	+
+	+	-	+	-	-	-	+	-	+	-	+
+	+	-	+	-	-	+	-	+	-	+	+
+	+	-	+	+	+	-	+	-	+	-	-
+	+	-	+	+	+	+	-	+	-	-	-
+	+	+	-	-	-	-	+	-	+	+	+
+	+	+	-	-	-	+	-	+	-	+	+
+	+	+	-	+	+	-	+	+	-	-	-
+	+	+	-	+	+	+	-	+	-	-	-
+	+	+	+	-	+	-	-	-	-	-	-
+	+	+	+	-	+	+	+	-	-	-	-
+	+	+	+	+	-	-	-	+	+	+	+
+	+	+	+	+	-	+	+	+	+	+	+

DEFINITIONS

District Variables

1 (Numerical Size)
2 (Organizational Complexity)
3 (Teacher Variability)
4 (Teacher Experience)
5 (School-Unit Size)
6 = 12345 (Pupil-Teacher Ratio)

Schedule Variables

7 and 8: - + (Schedule A)
- - (Schedule B)
+ - (Schedule C)
+ + (Schedule D)
8 = 12347
9 = 1235 (Schedule Order)

Teacher Variables

10 = 1245 (Highest Degree)
11 = 1345 (Local Experience)
12 = 2345 (Span of Grades Taught)
+ = Above state means
- = Below state means

Analyses of interviewing and sorting data which are related to the design matrices are presented in Chapters 10 and 11, respectively.

Identifying individual teachers. The design matrices defined the characteristics of teachers and districts whose cooperation was necessary to balance the designs for the interviewing and sorting studies. The determination of the individual teachers who would participate in the studies was accomplished by means of a three-step procedure. The first step was to secure from WSDPI records the names of all elementary teachers who worked in the sampled districts. Second, the teachers within a district were ranked according to degree of 'fit' of the teacher typology specified by the design matrix for that district. This second step was necessary only in those districts which did not have a teacher who fit the assigned typology. If more than one teacher fit the given typology in a district, they were assigned rank-order positions at random. The third step in selecting a teacher was to contact the district superintendent and confer with him about the availability of the teacher who was 'optimal' according to the rank-ordered list. If that teacher could not participate, the teacher ranked second was considered, and so on. Thirty-two teachers were thereby recruited to be interviewed, and 32 teachers were recruited to participate in the sorting experiment. With one exception--a very small district which employed only one teacher--the two samples were independent.

CHAPTER 6

THE DEVELOPMENT OF SORTING EXPERIMENTS

The empirical study of teachers' views regarding the facilitation of learning required procedures for manifesting and explicating teachers' perceptions of classroom relevant behaviors and events. Chapter 5 presented the procedures specifying a finite set of behaviors and events in the form of content units. The purpose of this chapter is to describe the use of content units in investigating teachers' perceptions and cognitions. The first section of the chapter discusses the construction of a sorting task which allowed teachers to manifest and explicate their views of facilitating learning. The second section describes the major facets of sorting-task administration, with emphasis on the factors which affected the design of sorting experiments. The work discussed in these sections was undertaken during Phase B of the project (see the Research Triptych, Chapter 2).

6. CONSTRUCTION OF THE SORTING TASK

The production of a set of content units provided a basis for operationally defining the project objective, which was to investigate the substance and structure of teachers' views concerning the facilitation of learning.

Purpose and Function of Sorting

In Chapter 1 the substance of teachers' views was defined in terms of percepts of content units. The structure of their views was defined as the categorization of content units according to a process of discriminating similarities and dissimilarities among them. Consequently, a procedure which would manifest and explicate teachers' views of a set of content units would involve asking teachers to:

1) sort a set of content units into categories according to the similarities and dissimilarities which they discriminated among the units, and

2) overtly express the substantive meaning which they differentiated in various categories of content units.

The product of a single teacher's performance of these two steps would be an array of categorized content units. A paradigm of this array is given in Figure 6.1. Each category of such an array would contain content units which a teacher considered to be similar to one another in terms of his perceptions and cognitions regarding the facilitation of learning. The teacher's expressed meaning for his categories would be a summation of his percepts of the content units contained in each category. A teacher's discrimination of dif-

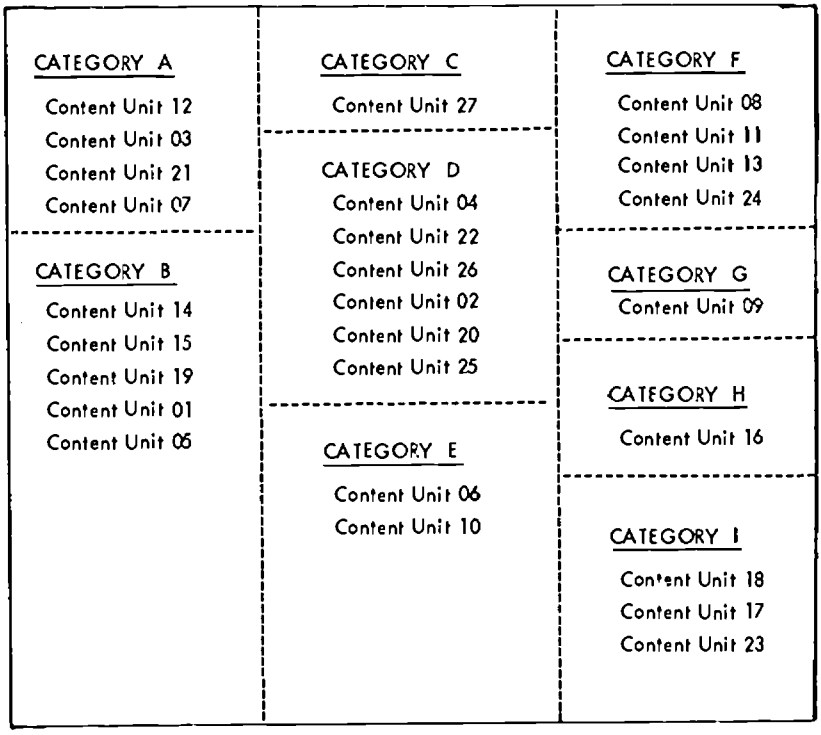


Figure 6.1. Paradigm of a sorter's manifest partition of a set of 27 content units.

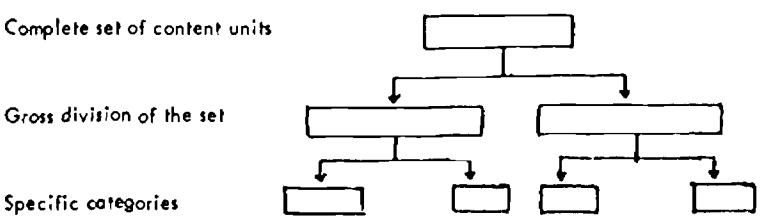
ferences among certain units would be reflected in the construction of several categories, each of which would contain one or more content units. An array of such categorizations, as noted in Chapter 1 and explained in Chapter 7, may be transformed into a matrix which numerically describes the structural relationships among a set of content units.

The project objective implied the need for a sorting procedure by which a teacher could physically manipulate a set of units according to his views of facilitating learning. The basic steps of the procedure would require a teacher

1) to read each content unit description,
2) to formulate a percept of each unit, and
3) to construct groups or categories of the units according to his own perceptions of the similarities and dissimilarities among units.

As with the development of interview techniques and content summarization procedures, the mechanical operations of sorting must allow a teacher freedom to formulate his own ideas of the substantive meaning of content units and to arrange the content units into categories of his own definition. Any procedure which involved the use of non-teachers or which placed arbitrary restrictions of a teacher's sorting would tend to invalidate the achievement of the project objective.

Several methods of sorting content units into categories were tried. One method was to derive categories by dividing a set of units into two broad categories and then further subdividing these sets of units:



It was found that this procedure was extremely time consuming and that it was psychologically unsatisfactory. Sorting in this manner is grossly inefficient. Each content unit must be manipulated once for each hierarchical level. For example, if 600 content units are used, and if the hierarchy has 10 levels of subdivision to produce specific categories, a sorter must make 6,000 decisions about content units. An alternate method

of handling the mechanics of sorting would be for a teacher to specify the major categories of his views about learning and then to place the content units into these categories. This procedure would require a teacher to formulate a general a priori taxonomy of his views of facilitating learning. Such a procedure might result in a sorter's anticipating the meaning of a content unit in terms of his classification, rather than first considering the meaning of the described behavior and then deciding whether it was similar to other content units. Thus, prior definition of possible categories would tend to bias a teacher's perceptions of content units. After various efforts, a sorting process was constructed which appeared to satisfy the general requirements.

Definition of the Sorting Task

The sorting task developed for data gathering directed a teacher to follow a sequence of operations by which he was able to consider each content unit in relative independence from other units, and to physically arrange a set of content units according to the similarities and dissimilarities perceived. The mechanical process of sorting involved putting together, or grouping, of any two or more content units which concerned, from the teacher's viewpoint, the same aspect of facilitating learning.[1] The major steps of the sorting task were:

1) Read and think about the first content unit.

2) Decide with what aspect of facilitating learning the content unit is concerned.

3) Write down a tentative statement of that aspect of learning.

4) Place the content unit in a pocket to begin a category or group.

5) Take the next content unit and perform steps 1 and 2. If the second unit concerns the same aspect of facilitating learning as the first, group together the two units. If the second unit concerns a different aspect of learning, perform steps 3 and 4.

6) Repeat steps 1 through 5 for each content unit.

[1] The content units were prepared on 2 1/2" x 8 1/2" slips of paper which were then thoroughly mixed before arranging in a single pile. The sorting board was a piece of 22" x 28" heavy duty cardboard to which were glued thirty-six 5" x 3" blank index cards. A portion of each card, approximately 1 1/2" deep, was folded under and glued to the board so the cards stood one behind the other about 3 1/2" high. The 1 1/2" space between any two cards formed an area into which the content unit slips could be placed. The protruding blank index card provided space for the sorter to keep a running record of his idea, or aspect of facilitating learning, corresponding to the unit or units which were filed immediately behind the index card. Further details are given in Appendix F.

The first pilot tests of the sorting procedure were administered to two teachers who categorized a relatively small number (40) of content units. The units were typed on separate slips of paper which were then arranged in random order. A sorting board was also designed which allowed easy manipulation of the units and categories.[1] Figures 1.5 and 1.6 illustrate the arrangement and use of the sorting board. Information and experience gathered during the pilot tests indicated the need for three additional steps. These new steps allowed the sorter to re-sort or to modify the categorization of the first several units processed from the perspective of units encountered later. The additional steps were:

7) Re-sort at any time during steps 1 to 6 when a unit is encountered which does not belong where it was previously placed. The re-sort may involve

   a. placing a unit in another group,
   b. starting a new group, or
   c. mixing it with the units not yet sorted.

8) Review the groups carefully after completion of steps 1 to 6. Review the ideas of each grouping with special concern for whether the units belong together. Changes may be made by dividing, combining, or switching the statements. If in doubt, begin a new category.

9) Check after sorting all units to see that a word or short phrase has been written (on each category index card) which gives the central idea explaining why the units were grouped.[2]

During the pilot tests, teachers indicated that the sorting process was meaningful and intrinsically interesting. They reported that the task required concentration and intensive thought. Somewhat to their surprise, they found that the final set of categories which they had constructed was a reasonably accurate portrayal of their views of classroom teaching and learning.

Special attention was given during the pilot work to the kinds of categories teachers formed and the kinds of criteria by which the teacher grouped the units. When introducing the task to the sorters, the purpose of the project was explained as an effort to understand the nature of teachers' views, and not to evaluate the relative merits of various kinds of classroom practices. It was emphasized that the grouping of units should concern only whether or not the sorter considered the described behaviors and events to be similar, and not whether the sorter considered the description to refer to "good" or "bad" aspects of teaching. Decisions as to whether units belong together in one category were to be based on the teacher's own

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[2] An additional step was formulated and used in several studies. This step involved the sorter in displaying the network of relationships among the array of categories by a process of grouping together the categories which were similar to each other. Details of this process of building a hierarchy are given in Appendix F, but they are not discussed in text for no completely satisfactory approach was developed for analyzing the hierarchies of several sorters.

view of facilitating learning in terms of his actual experiences and practices in the classroom. Each group, it was explained, would probably contain content units which the sorter might feel represented "good" or "bad" teaching, but all units grouped in one category should refer to a particular aspect of facilitating learning. No directions were given to the sorters as to the number of categories which they were expected to construct or as to the number of units expected in any single category. The sorter was free to create and define his own sets of categories. It was, however, emphasized that a sorter should make fine discriminations and construct categories in terms of very specific aspects of teaching and learning. For example, a single category which contained units referring to reading would be considered unsatisfactory and would need to be separated into several categories concerning the various aspects of teaching reading.

The information and difficulties encountered during the pilot tests provided the basis for the preparation of a set of instructions for the administration of sorting tasks. The complete set of instructions is contained in Appendix F. The next section of this chapter will discuss selected facets of the sorting task and factors important to the design of experiments involving large numbers of content units. The final section of the chapter will present the plans of the first two major experiments carried out for investigating sorting behaviors and procedures. Concurrent with the pilot work and with the two experiments, a mathematical approach to the analysis of sorters' categorizations was developed and is described in Chapter 7. Further details are given in Appendix G.

b. SELECTED FACETS OF SORTING EXPERIMENTS

Information and experience gained during the early study of the sorting procedures indicated the importance of training teachers before they performed a sorting task and delineated certain factors which needed careful consideration before a particular task was planned.

Important Aspects of Training

A training session consisted of providing each teacher with a set of materials, a booklet of instructions, a chance to practice sorting, and a review of the task to be performed. Complete details of these activities are given in Appendix F. The instructor discussed each item in the instruction booklet and directed the teachers in a practice sorting task. During the discussion and practice, three aspects of the task were emphasized: 1) discrimination criteria, 2) category formation, and 3) step-by-step sequencing.

The major function of the training session was to instruct the teachers in the process of sorting. To minimize the influence of the instructor on the substance and structure of teachers' categories, a special practice task was developed involving the sorting of content units which described behaviors and events in various kinds of stores. Two of these practice units were:

> Practice Unit 24
>
> This owner of a clothing store will not allow a customer to browse through the shirts or trousers by himself; he always insists on showing everything to the customer.

> Practice Unit 29
>
> This clerk in a women's clothing store tries to dress stylishly because she feels her appearance has something to do with influencing customers to buy.

When the teachers practiced sorting with these items, they followed the basic steps of the sorting procedure but were instructed to put together the units which related to similar concerns in running a store (for complete details see Appendix F). The use of this practice task allowed free discussion of the sorting operations without the instructor influencing a teacher's view of facilitating learning. During the discussion and practice sorting, the instructor emphasized the three aspects of the sorting task discussed in the following paragraphs.

Discrimination criteria. Throughout the training session the importance of considering each unit and category of units according to the teacher's own views of facilitating learning was emphasized. The major difficulty teachers encountered was in deciding the similarities and dissimilarities of two or more units according to this criteria. In general they tended to make judgments on the "goodness" or "badness" of a described behavior or event, particularly in terms of whether they might or might not engage in a certain practice. The grouping of units according to common aspects of the teaching-learning process appeared to be new to them. Some teachers wished to classify according to aspects of subject-matter or curriculum. With the practice units, a category could be defined by grouping all items which involved behavior and events in a store,with the categorization criterion being that of facilitating the operation of the business. For example, a category entitled "customer satisfaction" might include units describing grocery stores as well as clothing stores. After a short period of discussion and practice, teachers were able to accept and to understand the criterion of categorizing in terms of aspects of facilitating learning.

Category formation. The concept of a category seemed to be novel to teachers. Their tendency was to rank-order the units rather than to group them. First attempts at grouping units were often in terms of very broad types of classroom affairs such as major subject-matter areas. At first the sorters experienced difficulty in making fine discriminations in terms of teaching-learning behavior. The idea that they would construct ten or more categories often puzzled the teachers. After some discussion and practice, however, they were comfortable with the task guidelines and the evolving process of the sorting procedure. Very soon they were comfortable and conscientiously concentrating on content unit category construction.

Step-by-step sequence. During the training session emphasis was placed on the importance of sorting items in the step-by-step sequence given in the instructions. Teachers often wished to take a relatively large number of units and compare them to each other for the purpose of grouping. The step-by-step sequence tended to focus the teacher's attention on the individual unit first and then on the unit similarities or dissimilarities. One result of this was that a teacher might construct categories of an almost identical nature. This was deemed desirable from the standpoint of the data analysis techniques. It also kept teachers from constructing categories containing large numbers of items ($n > 30$).

The final step in the training session was to provide teachers with a small set of content units describing classroom behaviors and events of the kind which they would sort in the main task. This set of units provided for a brief trial run and for the clarification of any remaining questions. A training session usually required 40-60 minutes. Several attempts were made to shorten this time, but such

shortening resulted in unsatisfactory behaviors from the sorters. The major difficulty was that, without complete and detailed instructions, teachers generally constructed only a few categories, each of which contained a large number of units.

Planning a Sorting Task

The use of these procedures in a particular study involved decisions about the five major variables of the sorting task: number of content units, order of content unit presentation, time allowed for administration, stage at which re-sorting occurred, and the number of sorters. The following paragraphs will discuss the general considerations given to each of these task variables. Exact specification of each variable, however, can only be made in the perspective of the objectives of a particular sorting study. This will be illustrated in the three major sorting experiments described in Chapters 11 and 12.

Number of content units. Decisions concerning the number of content units to be used in a particular task required consideration of the domain of content being investigated, the capacities of sorters for concentrated work, and the approach to the analysis of categorizations. In general, investigation of a relatively small domain of content requires few content units. For example , 130 or less content units can be sorted without undue stress by a sorter, and all categorized units may be included in a single analysis. A larger domain of investigation may require the sorting of 150 or more content units. As the number of units increases, heavy demands are placed upon the special analytic procedures required. When a relatively large domain of content is under investigation, appropriate experimental designs and sampling principles can be used to keep at a minimum the number of content units needed and, therefore the time and energy expected of sorters. The special techniques necessary for analysis are also kept at a minimum.

Order of content unit presentation. The sequential nature of the sorting operations required that careful attention be given to the order in which content units were presented to a sorter. Due to the method of deriving content units from interview recordings, the sequence of interview topics was reflected in the consecutively numbered content units. Consequently, presentation of the units according to their consecutive numbering was likely to influence a sorter's construction of categories. As this ordering effect could not be studied in detail, the possibility of its occurrence was counter-balanced by randomization of content units. This randomization minimized any artifacts due to primacy of recency effects.[1]

[1] For detailed definition of these effects see R. S. Woodworth and H. Schlosberg, Experimental Psychology, 1965.

In addition, a sorter tends to pace his sorting rate according to the number of content units he was given to sort. Occasionally, when a sorter was given 40 or 50 units at one time, he would look ahead and select units which he considered to belong in categories already established. This selection tended to rigidify the categories and prevent their construction on the basis of percepts of content units. To minimize problems related to the sequencing of sorting, the content units were presented to sorters in packets. Each packet consisted of 20-26 content units. For example, if a task involved 100 units, the units were first put into random order and divided into groups of 20. The packets of 20 were then randomly ordered for each sorter. Thus the content units were presented to each sorter in a different random order.

Time allowed for administration. The administration of a sorting experiment involved four major kinds of activities: training, sorting, final re-sorting, and completion of record-keeping. The time required for training, final re-sorting, and record-keeping was relatively constant for most sorters. The actual time of sorting the set of content units varied considerably due to the individuality of sorters, particularly with regard to their rate of sorting and their need for rest periods. Some uniformity could be obtained by regularly notifying the sorters of time. However, scheduled time for a particular task needed to be sufficient for most sorters to comfortably complete the task without undue haste. From experience and data obtained on sorting rates it was found that 120-140 units could be sorted comfortably within 2 hours by most sorters. Therefore, in general, administration of a sorting experiment involving 120-140 units could be scheduled for a three-hour period: 40-60 minutes for training, 90-120 minutes for sorting, and 10-30 minutes for trial re-sort and record-keeping.

Stage of re-sorting. The function of re-sorting, as defined above, was to provide an opportunity for sorters to review the composition of their categories from the perspective of a relatively large number of sorted content units. Because of the strict step-by-step sequence of the sorting process, sorters were prevented from gaining a broad view of the variation across sets of content units. In the early pilot work sorters reported that the orientation of their thinking often changed after sorting 20-30 content units. They apparently felt the need to modify their first groupings to display a set of categorizations more consistent with the gradually evolving pattern of their perceptions and cognitions of the described behaviors and events. Such reactions were expected at any stage of the sorting, for sorting was designed to promote evolution and induction of categories rather than construction via deduction. However, the reports of sorters strongly suggested the need for an opportunity to establish perspectives of thought at an early stage of sorting. For this reason, sorters were directed to review and re-sort after grouping the first 30 to 40 units, and an experimental study (see Chapter 11) was made to determine the effects of re-sorting at dif-

ferent stages of the sorting process. A review and modification of groupings early in the sorting process was called a minor re-sort. A final review and alteration of categorizations was provided when a teacher had completed sorting all content units; this was called a major re-sort, and its prime function was to permit a teacher to check the consistency of all categorizations and to separate large groups of units into smaller groups. The function of minor and major re-sorts, as explained in the training session, was to ensure that content units were homogeneously grouped and not necessarily to provide opportunity for extensive re-structuring or redefinition of categories.

Number of sorters. The prime function of the sorting task in this project was to gather empirical data concerning teachers' views of classroom behaviors and events. The quantitative measurement of teachers' views is derived from combining several teachers' categorizations according to the procedures outlined in Chapter 1 and specified in detail in Chapter 7 and Appendix G. Analysis of the quantitative measure of sorters' categorizations revealed that the stability of the results are functionally related to the number of sorters performing the task. In general, the greater the number of sorters, the more stable are the results. (This is also true for other research techniques involving statistical analysis, such as factor analysis.) A general guideline, based on the studies carried out in this project, is that at least thirty sorters are needed for analytic results to be seriously considered.

CHAPTER 7

CATEGORIZATION METHODOLOGY: ISSUES, THEORY, AND ANALYTIC IMPLICATIONS

The purpose of this chapter is to synthesize the theoretical dimensions of the research paradigm presented in Chapter 1 in terms of (a) the observational procedure of sorting and (b) the mathematical procedure of latent partition analysis (LPA). Discussion centers on the perceptual processes of coding and discriminating and on the appropriateness of the latent partition model for describing them. The chapter is divided into two sections. In the first section, the correspondence between the hypothesized psychology of teachers' perceptual frameworks and their specific manifestations in the sorting task is discussed. In the second section, the correspondence between features of sorting behaviors and features of the latent partition model is discussed and the computational procedures of LPA are briefly reviewed. The computations are formally presented in Appendix G.

The major empirical results of the methodology are presented in Chapter 12, which is most importantly a report of data and of methodological technique. However, there are three general scientific reasons for presenting the theoretical discussions of this chapter along with the empirical results of the project: 1) to illuminate the motivation for performing the elaborate series of experimental procedures, 2) to provide a framework for reading and understanding the results of this study and their interpretations, and 3) to provide a perspective for the results in suggesting further paths of research. The theory is not presented formally, and it is not intended to be exhaustive: the theory is essentially linked to the data. The interests and purposes which arise from considering the procedures encompass so many theoretical domains--perception, cognition, teaching, personality, factor theory, and others--that exhaustive presentation of all relevant theory would be impractical.

a. PSYCHOLOGY AND MANIFESTATIONS OF SORTING BEHAVIORS

The domain of content for this research consisted of experienced teachers' views on facilitating student learning in the classroom. Specifically, the domain consisted of those cognitive views and perceptions of teachers concerning their classroom behaviors and experiences, as they relate to facilitating learning, which could be reported and recorded. Operationally, the domain consisted of statements that teachers make in the particular kind of interviews described in Chapter 5. As explained in Chapter 1, the central objective of this research was to obtain knowledge about this domain which is considered important

because it is influential in the classroom learning process and because it is a central issue in improving education.

An immediate question arises about the data collection process: How successfully was the domain recorded, with respect to both permeation of the domain and faithfulness to the stylistic expression of teachers? No test of this is directly possible, since there were no prior substantive hypotheses about or studies of the domain. It is worthwhile, however, to refer to the conditions for conducting interviews to examine the kinds of perceptions and cognitions which were searched for. Those interviews stressed ordinary communications between teachers and the evocation of teachers' thinking about teaching. First, the interviews were conducted in the school during an ordinary school day. Second, the interviews were focused to provide discussion in terms of real experiences and events. Third, both interviewers had teaching experiences.

Another relevant question concerns whether the tape recording captured the essense of the interview. Some expression was lost, of course, but the interviewers were careful to insure verbalization, so presumably most expression was recorded.

The interviews could not, of course, be manipulated directly; they were too bulky and too inefficiently organized. The interview materials represented in this report (see Chapter 12) are an organized sample of the interviews. In terms of the operations performed for manipulating and presenting the interviews, for communicating their contents, the interviews had to be sampled. In particular, for the operational purposes of the sorting experiment, the sample had to consist of small, readable content units. Sampling was accomplished through a series of elaborate but replicable procedures: judging, blocking, stratified sampling. Because of this systematic sampling, the variety (permeation) is limited only by the sample size, which is 128 content units and is probably adequate. The fidelity of the content units to teacher-style expression is limited by the qualities of judging and blocking. The content units should probably be considered realistic and useful for studying teacher perceptions because they were spoken by teachers in the interviews and were considered unitary by the teachers who did the judging and blocking. Presumably, then, they are like the perceptual units teachers operate with in their real perceptions of teaching, in communicating with other teachers or in thinking about teaching, and therefore they are suitable for manipulation.

Once the content units were constructed, many experimental procedures could have been employed to structure them. The method chosen has certain advantages in terms of maintaining the general standard

of recording teacher viewpoints. First of all, the sorting procedure does not add any extraneous, uncontrolled verbalization, such as would ask a teacher to talk about the units. The task involves the basic perceptual process of simplifying the complex environment. This process is common to all people and is necessary for thinking, for communicating, and for interacting with the environment. Therefore the task uses and evidences the very process which form the structure to be uncovered in the domain of substantive substantive content. For the purpose of discussing the simplification process, two special terms will be defined: coding and categorizing. These are both considered part of the general process of simplification, but will be operationally differentiated in terms of the sorting task.

Percept Formation

Of first concern in describing sorting behavior is the reaction of a teacher to the single stimulus, the content unit. Coding is defined as the process of generalizing and reducing, of simplifying a stimulus to some essential representation of it. Teachers code when they consider general classes of events rather than the continuous and unique happenings in the series of events that they encounter in the classroom. This is evident in the interviews, for example, when teachers communicate about general problems and techniques in teaching spelling or maintaining discipline, without referring to specific events that they have experienced in the classroom. The teachers who performed judging and blocking were coding, for they were removing specificity from the statements made in the interviews. Operationally, coding is considered to be the judging and blocking kind of simplification; it is also considered to take place when a sorter reads and remembers a particular content unit.

In the sorting task, coding is required of the teachers in two ways. First, a content unit must be put in exactly one category, so some facet of it must be selected and the content unit must be considered as if it contained only that facet. The method of construction of the content units--in particular, that the interviewees, judges, and blockers were all teachers--tended to insure that from a teacher's viewpoint the content units did each have one dominant idea. Second, the sorter, in manipulating the large mass of data, probably had to have some shorthand, coded form of a content unit just to keep track of his categories. The understanding made and remembered of a content unit is called a percept and represents a rather low level

of simplification in the sense that teachers probably tend to have fairly similar percepts of a content unit, and their percepts probably do not differ much from non-teachers. Evidence for percept formation is found in the ability of teachers to write a category title on each new category and in the ability of the judges to cut up the interview tapes.

Discrimination of Content Units

The sorting process requires comparison of content units. More exactly, it requires comparison of the coded forms, of the percepts of the content units. Essentially, one does not compare words, one compares understandings of words. Comparison of percepts is manifested in discrimination and categorization. Categorization in this special sense may be considered as another form of simplification. It is useful in understanding the sorting task to differentiate the concepts of coding and categorizing in these terms: coding as perceiving a single content unit, categorizing as perceiving several content units; coding as forming simplified linguistic storage of a content unit, categorizing as attaching an outside linguistic label to a set of content units. For example, when a teacher sees in an exercise book that he is to have students repeat answers to addition problems, he may code that instruction to "having pupils repeat after the teacher" which he may consider in a category labeled "drill." Whether he uses the exercise may then depend on his attitude toward drill in general.

There is evidence for a categorical framework special to teachers in the verbalizations and communications that they make of their perceptions of classroom teaching. Teachers are categorizing when they use elements of their special vocabulary; for example, they label classroom actions with such words as "drill" and "evaluation" and "disciplinary" and they mean special things. There is also internal evidence in the sorting task, for commonalities were found across sorters, and sorters revealed to the researchers that they found the task "realistic," that they were "comfortable" about their categories, that they had always used and known such categories.

The general research objective may now be stated as determining facts about the coding and categorizing that teachers make of their behaviors, experiences, and thoughts concerning classroom facilitation of learning. Conversely, the notions of categorizing and coding provide a framework for reaching an understanding of the empirical results--the data--presented in Chapter 12. The sorting task did not require

or allow generation of verbal expression and organization[1]. Instead,the expressions of perceptual organization were made through the items themselves. By forcing the sorters to form categories and, in particular, to put each content unit in just one category, the sorting task forced sorters to use their coding and and categorizing perceptual abilities and thus to reveal some of their perceptual framework and processes.

It should be noted that the assumptions about underlying processes of coding and categorizing do not explain how the sorting task works in the sense that no specific hypotheses are made about the sequence of information--processing steps involved in the manipulation. When are percepts formed and remembered? When are percepts compared? When is internal reference made to past experience? When are systems synthesized? These are questions beyond the scope of the present theory. For example, there are certainly differences between the information-processing of the first item and of the succeeding items. The experimental procedure attempted to skirt such questions by randomizing the order of the content-unit stimuli.

b. ANALYSIS OF SORTING BEHAVIOR

The description above of the coding and categorizing that is hypothesized to take place in sorting is phrased in terms of an individual teacher-sorter. The manifest categorization of a particular teacher might be considered of intrinsic interest for in-depth analysis, but it would reflect, of course, the particular training, experience, and personality makeup of the teacher. In order to reach a more general understanding of teachers' perceptual frameworks, it is necessary to consider the categorizations of several sorters. This is predicated on the belief that teachers have commonality in their coding and categorizing processes. Obvious evidences of commonality are the common terminology of the teaching profession and the ability of teachers to communicate with one another. Since coding and categorizing, in the sense discussed here, are evidently learned functions, it is reasonable to infer commonality from the relatively similar backgrounds and experiences of teachers.

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[1] The manifest category titles are exceptions, but it can be assumed that manifest category titles served, at least during the sorting itself, as orientation on the sorting board.

The data from a sorting experiment consist of several categorizations of a constant set of content units. Such data are the input for latent partition analysis (LPA). The major objective of the analysis is to summarize the data in such a way that the major similarities and differences in the categorizations are made apparent. The first summarizations of the data for LPA are in the form of a matrix called S.

S = the joint proportion matrix

This is a rescaling of the kind of matrix illustrated in Chapter 1. An S matrix has as many rows and columns as there are content units. All the diagonal entries equal 1.0. An S matrix is symmetric; each entry below the diagonal equals the corresponding entry above the diagonal. A number in an S matrix corresponds to a pair of content units, and that the number is the proportion of sorters in whose categorizations that pair of content units appeared in the same manifest category. An S matrix is a summary or reduction of the data or sorting experiment because the complete information about the manifest categories cannot, in general, be reconstructed from S.

The rest of this section is devoted to explaining the features and computations of LPA and, in particular, to showing the relationships between the features of the latent partition model and the features of the hypothesized psychology of the sorting experiment as presented in the previous section. The latent partition model and its computations are detailed in Appendix G. No claim is made for the exact correspondence between the latent partition and the psychological model, and, in fact, no claim is made that the latent partition model is accurate or even reasonable. Like all mathematical models, the latent partition model is on its face inadequate. The latent partition model ignores the effect of order of presentation of content units and the consequent differential information-processing applications; it specifies unusual constraints on agreement of percept assignment; it specifies that the major sources of variations are random and independent. But the latent partition model has not been proposed to provide profound understanding of the sorting behavior. Rather, it has been proposed and implemented to provide an analysis of the data of the sorting experiment, to provide automatic reduction and summarizations of an S matrix, to provide a clearer picture of several sorters' categorizations.

Latent Categories

If there were two manifest categorizations of a set of content units, then one might consider looking at the refinement categorization defined by them--that is, at the intersections of the categories of two sets. If there are five content units:

A, B, C, D, E

and the two categorizations are:

(AB) (CDE)
(ABC) (DE)

then the refinement categorization is:

(AB) (C) (DE).

The refinement categories consist of the content units that both sorters found similar. In LPA terminology, the refinement categories are called latent categories. The latent categorization is sufficient to explain each of the manifest categories in the sense that each manifest category is either a latent category or a union of latent categories. The content unit discriminations between the latent categories include all discriminations between content units in both manifest categorizations.

The mathematical representation of the latent categorization is in the form of a matrix called Φ (Phi):

Φ = the latent category matrix

Phi has as many rows as there are content units and as many columns as there are latent categories. Each row of Phi corresponds to a content unit and indicates which of the latent categories the content unit belongs to. The row has a 1 in the column corresponding to that latent category and 0's in the other columns. Note that the latent categorization is assumed to have the same property as the manifest categorizations: each content unit must belong to one and only one latent category. The latent categories are the features of the latent partition model which correspond to commonality of perception. It is assumed that the sorters, as a group, recognize the latent categories as defining the essential discriminations among the content units.

If there are many sorters and hence many different manifest categories, the simple concept of refinement is not sufficient to describe latent categories. With even a moderate sample of sorters, it is usual that no one pair of items are always together in the manifest categorizations, and consequently and reduction, the number of latent categories must be less than the number of content units. This motivates defining a probabalistic notion of category similarity.

Probability Transformation

For larger numbers of sorters, as noted, the latent categorization cannot assume all the discriminations made by all the sorters. As a data analytic resolution of this problem, some further specification is made about the relationship between the latent categories and the manifest categories. In particular, a probabalistic model is defined for the sorting process. This model is structured with respect to a latent categorization such that a sorter's manifest categories represent probabalistic blends of latent categories. That is, not only may a sorter combine several latent categories, but he may blend several latent categories, combining their items independently but with fixed probabilities. Thus a sorter may have discriminations in his manifest categories which are not made in the latent categories, but such discriminations are assumed to result from random assignment with probabilities which depend on the latent categories.

The individual characteristics of a sorter are assumed to reside in the distinctive probability patterns and levels with which he merges and splits latent categories. In the latent partition model it is assumed that each sorter's sorting process is characterized by a matrix Π (Pi).

Π = a sorter's probability transformation matrix.

This matrix is assumed to have as many rows as there are latent categories. The number of columns in Pi is distinctive for a sorter and is the number of manifest categories in the model for the sorter. The entries of Pi define the probabilities for the sorter's random process. For a given content unit, the sorter is assumed to recognize the latent category of the content unit and then to assign it randomly to one of the manifest categories according to the probabilities given in the row of Pi corresponding to the latent category of which the content unit is a member. The assignment of content units is assumed to be made independently.

It is difficult to put a substantive interpretation on the matrices. However another matrix is definable from the matrices; it is called Ω (Omega).

Ω = the confusion matrix.

Omega is formally defined as the average over sorters of $\Pi \Pi'$. It has as many rows and columns as there are latent categories. It is symmetric; each number above the diagonal is equal to the corresponding number below the main diagonal. It can be shown that a number in Omega, which corresponds to a pair of latent categories, is the probability, averaged over sorters, of the latent categories being merged. More exactly, it is the probability that any particular pair of content units from the latent category will be put in the same manifest category. These probabilities are called the confusion probabilities.

The probability transformations in the model are features which correspond in two ways to features in the psychological mode. First, the notion that a content unit ultimately belongs to a latent category, that a sorter recognizes that fact and then assigns the item according to his particular probabilistic warp of the latent category, corresponds to the psychological notion that a sorter forms a percept of a content unit in a generally similar manner to the other sorters, and then behaves according to the percept identification. Second, the notion of confusion corresponds to individual perceptual differences in the psychology. There are many perceptual reasons for a sorter's tending to confuse or merge two latent categories. There might be experimental error; perhaps some same sorters understood the instructions differently and formed oversimplified categories. There might be experimental differences; a primary teacher does not need all the discriminations an intermediate teacher does, and vice versa. The term "confusion" is not intended to be pejorative but rather to indicate individual differences with respect to group norms.

LPA Computations

The input to the LPA computations is an S matrix derived from the results of a sorting experiment. The objective is to estimate the latent partition parameters: the number of latent categories, Phi, and Omega. The details of the computations are presented in Appendix G, but the following notes give a general outline.[1]

Fundamental theorem. In Appendix G it is proved that under the assumptions of the LPA model

$$S - \Delta^2 = \Phi \Omega \Phi'$$

where Δ^2 is an unknown diagonal matrix called the diversity matrix. This theorem is true only in expectation but by the law of large numbers is assumed to be approximately true with real data.

[1] In the text of the report, no notational differentiation is made between parameters and estimates

Estimation of the number of latent categories. The number, L, of latent categories is estimated as the number of roots of S which are greater than 1.0.

Estimation of the diversity matrix. The diversity matrix is estimated by an iterative procedure in which the initial estimate is equal to the complement of the diagonal matrix of the highest off-diagonal entries in S and in which the successive approximations are derived by reproducing $S - \hat{\Delta}^2$ with its L largest roots and vectors and extracting the complement of the diagonal.

Factorization. Given the final estimate of the diversity matrix, a eigenroot and vector decomposition is performed:

$$S - \Delta^2 = \Gamma \Lambda^2 \Gamma' ,$$

where the columns of Γ are eigenvectors and the diagonal entries of the diagonal matrix Λ^2 are eigenroots.

Rotation. The first L columns of Γ are rotated by raw transvarimax rotation yielding $\Gamma\Theta$. The diagonal matrix Ψ is computed as the column sums of squares of $\Gamma\Theta$, and the final estimates for interpretation are:

$$\Phi = \Gamma\Theta\Psi \text{ and } \Omega = \Psi^{-1} \Theta' \Lambda^2 \Theta \Psi^{-1} .$$

CHAPTER 8

INVESTIGATING SORTING BEHAVIORS AND SELECTED TEACHER CHARACTERISTICS

The complete series of methodological steps described in Chapters 5, 6, and 7--interviewing, judging, blocking, sorting, LPA--has several advantages for investigating the substance and structure of teachers' perceptions. For the ultimate substantive and structural results of this series, presented in Chapter 12, the content units which were used had been extracted by teachers from interviews with teachers and were felt to be an adequate and reasonable sample of teachers' actions and beliefs. That is, they were natural materials for teachers to consider in a sorting task. The sorting task allowed teachers to manifest their perceptual organizations of the set of content units, and LPA brought out the commonality of their organizations and patterns of deviation from it. It is believed that the latent categories and the confusion probabilities represent important aspects of the general qualities and quantities of teachers' perceptual frameworks. Briefly, the series of methodological steps is assumed to have provided measurement, or a reasonable simulation, of the ordinary perceptual processes of teachers.

Sorting and LPA methodologies are new research tools, and the researchers felt it important to relate the LPA-derived evidence of individual teacher differences with other teacher characteristics and to investigate and demonstrate some of the features of sorting behavior. Individual variation in LPA is evidenced in Omega, the latent category confusion probability matrix. In that matrix, an entry corresponds to a pair of latent categories and is the probability, averaged over sorters, of uniform confusion (merging) of the content units in the two latent categories. In the latent partition model, it is explicitly assumed that sorters differ in their confusion probabilities, and that these differences are the source of the differences between the latent categories and an individual sorter's manifest categories. If there are several subgroups, assuming a constant latent partition, is described later in this chapter. This technique leads to a technique for comparing the latent categories of several different groups. Initially, separate confusion matrices were calculated for four subgroups of the 33 teachers who participated in the major sorting experiment. Systematic differences, in the confusion probability levels, were observed between the groups. However, because the sample sizes involved were small, the actual differences observed could not be considered definitive. Consequently, three new sets of data were gathered. In this chapter the intent, the background, and the technological and theoretical developments of these three studies are explained. Then, in Chapter 13, the results and interpretations of the analyses of the new data are presented.

The major disadvantage of the procedures outlined in Chapters 6, 7, and 8 is that they are very time-consuming. In particular, the extensive work required for the construction of the content units seems justifiable only when a domain of content is considered to be of great importance for empirical study, because a sorting task which involves the use of such content units requires considerable time for reading and physical manipulation. Yet to investigate individual differences in sorting behaviors, it was considered necessary to have large samples of sorters so that experimental manipulation of teacher characteristics and of sorting conditions would be possible and so that standard statistical methods would be applicable. For this reason, a modified sorting task was developed which operated according to the general principles of the complete methodology but which required much less time. This special sorting task involved the use of education-relevant verbs as content units, and sets of verbs were presented to sorters on computer punch cards. With this modification, the sorting task could be administered to large groups of teachers, and their categorizations could be automatically put into the computer for analysis.

This chapter has two sections. First, the verb sorting task is defined and comments are made about its substantive value with respect to the more general methodological procedures presented earlier. Second, the specifications and purposes of the three new sorting experiments are explained. The latter discussion is interwoven with the presentation of the LPA theoretical developments which were necessary for the analysis of the new data.

a. VERB SORTING AS AN EXPERIMENTAL TOOL

To save time in constructing content units and in sorters' reading and manipulation of them, the stimuli had to be reduced to single words. But, for the purpose of studying the perceptual framework of teachers, this implied a loss of meaning; single-word items would be more like the titles sorters attached to the categories of interview-derived content units than like the content units themselves. That is, single-word stimuli are not reasonable materials for natural teacher perception. A theory of perception in a sorting task might be logically divided into two parts: first, manipulation processes, which involve remembering and sequencing comparisons of stimuli, and second, depth processes, which might involve analyzing the syntactic and semantic values of the stimuli and associating them with past experience and perceptions. The information derivable from a sorting task in which single word stimuli are used is more closely related to manipulation processes than to depth processes; the material needed for deeper perceptual processing does not reside in a single word. Substantive interest of single-word stimuli is based on

tho fact that teachers make associations with single words, and thus introduce more complex information into the processes. Although the following description of the sorting task is presented in terms of using verbs as content units, somewhat longer stimuli could be used with suitable modification. In fact, the use of computer punch cards is generally applicable if the content units can be pre-printed on a card; the sequencing and arrangement of the decks can still be done by the computer, and sorting results can still be directly input to the computer.

The problem was, then, to devise a set of content units which would be useful and meaningful in the study of teachers' perceptions of classroom learning. It was considered essential that the set be grammatically homogeneous so that grammatical type would not be confounded with the substantive meaning of a word. Among the possible grammatical types of words, the class of verbs was found to be richest for this subject. There is a large number of unambiguous, simple verbs which describe unitary classroom actions. All verbs selected were phrased in present tense, third person singular. The verbs were chosen by the researchers. Two aids were employed for selecting an initial set of verbs. First a rough ad hoc classification of the things that teachers do was constructed, and verbs were selected which belonged to the classes. Second, standard education textbooks and taxonomies were searched for verbs. Also, several pretests of the sorting task led to refinement of the initial list; some verbs were found to be ambiguous, some were found to be unknown to the sorters, some were too general in comparison with the others. The final set of 50 verbs may be found in the tables in Chapter 13.

The use of single words (verbs) made possible simple and rather complete automation of the sorting task. First, the materials for a sorter were prepared by computer. A deck of computer punch cards was prepared with one verb per card. This deck was input to a special computer program which caused many copies of the deck to be punched, each of which was individually randomized in order. These decks were run through a standard IBM machine which printed each verb at the top of the card. Another IBM machine collated a supply of 25 blank cards and two specially punched identification cards for each deck. At the top of Figure 8.1 the order of the deck of cards given a sorter is pictured. A sorter received such a deck and a booklet of instructions. After the instructions were read aloud by a researcher, sorting began.

The instruction booklet given the sorters is presented as Appendix H. Logically, it consists of two parts: operational directions, indicating what the sorter was to do and in what sequence; and substantive directions, indicating what values and judgments were to be used as sorting criteria. The opera-

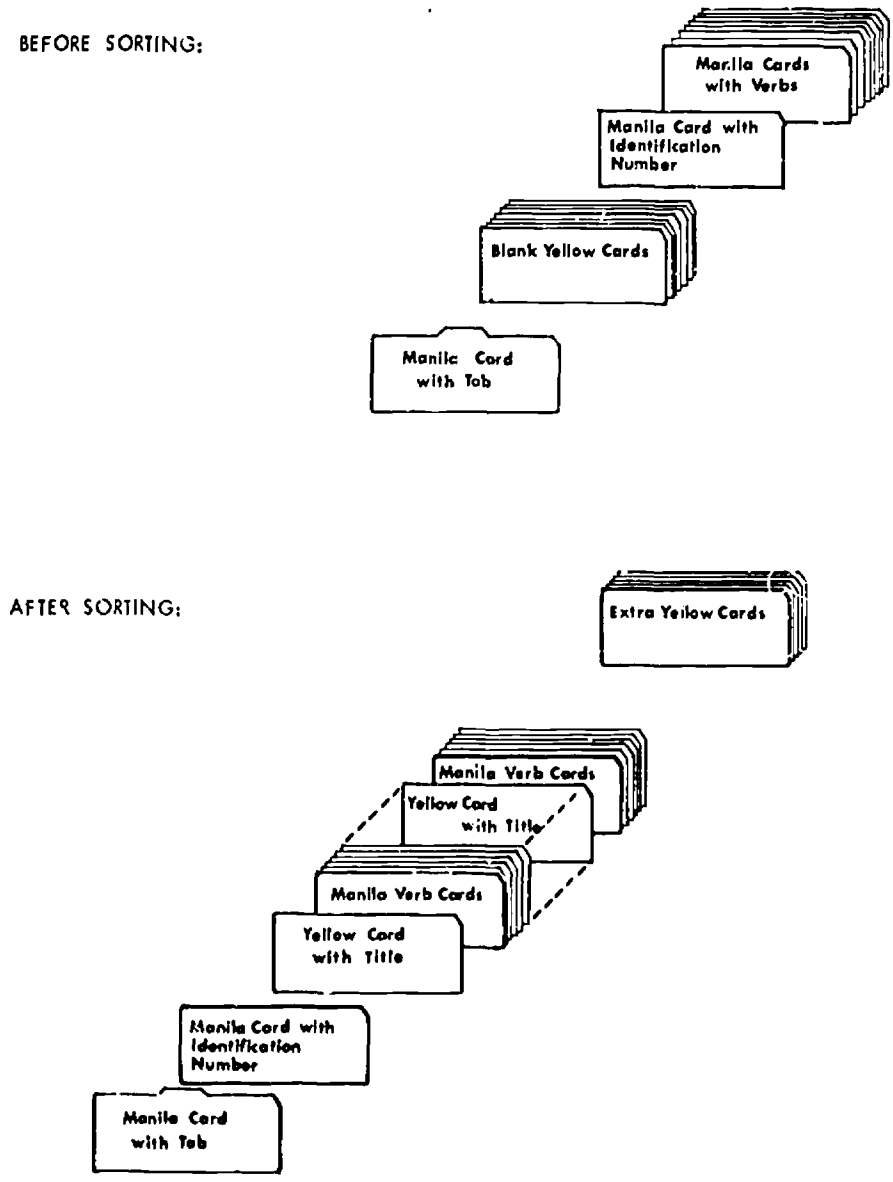


Figure 8.1 Arrangements of punch card decks in verb sorting experiments.

tional directions are summarized in the flowchart given as Figure 8.2. The substantive directions are scat - tered through the instruction booklet. A careful examination will verify that they are non-special. The sorting was not to concern "any evaluation or judgments of 'goodness' or 'badness'." Other than that statement, the substantive directions consisted merely of repetitions and permutations of the phrase "kinds of behaviors for facilitating learning in the classroom" as the criterion for sorting. Because the verbs were such obvious content units, because their meanings with respect to teaching were so well-defined, any further substantive direction would probably have dictated the categories.

Teachers finished the sorting task in 15-60 minutes. No time limits were set, although there may have been group pressures to stop, because the experiment was always given in large groups. When he finished sorting, a teacher was asked to collate his cards into the arrangement illustrated at the bottom of Figure 8.2 and to return the cards in a single deck. The arrangement of the verb cards and the position of the blank separator cards allowed identification of a sorter's categories. Furthermore, the special sorter identification cards headed each deck, so the entire set of decks from an experimental session could be collated into a single deck from which all the information of the experiment could be retrieved. Special programs were written to have the deck printed, so visual examination and exemplification of the categories could be made. The merged set of decks served as direct input for the LPA computer analysis program. With proper administrative procedures, the length of time between conceptualizing such an experiment and obtaining the analytic results can be made very short.

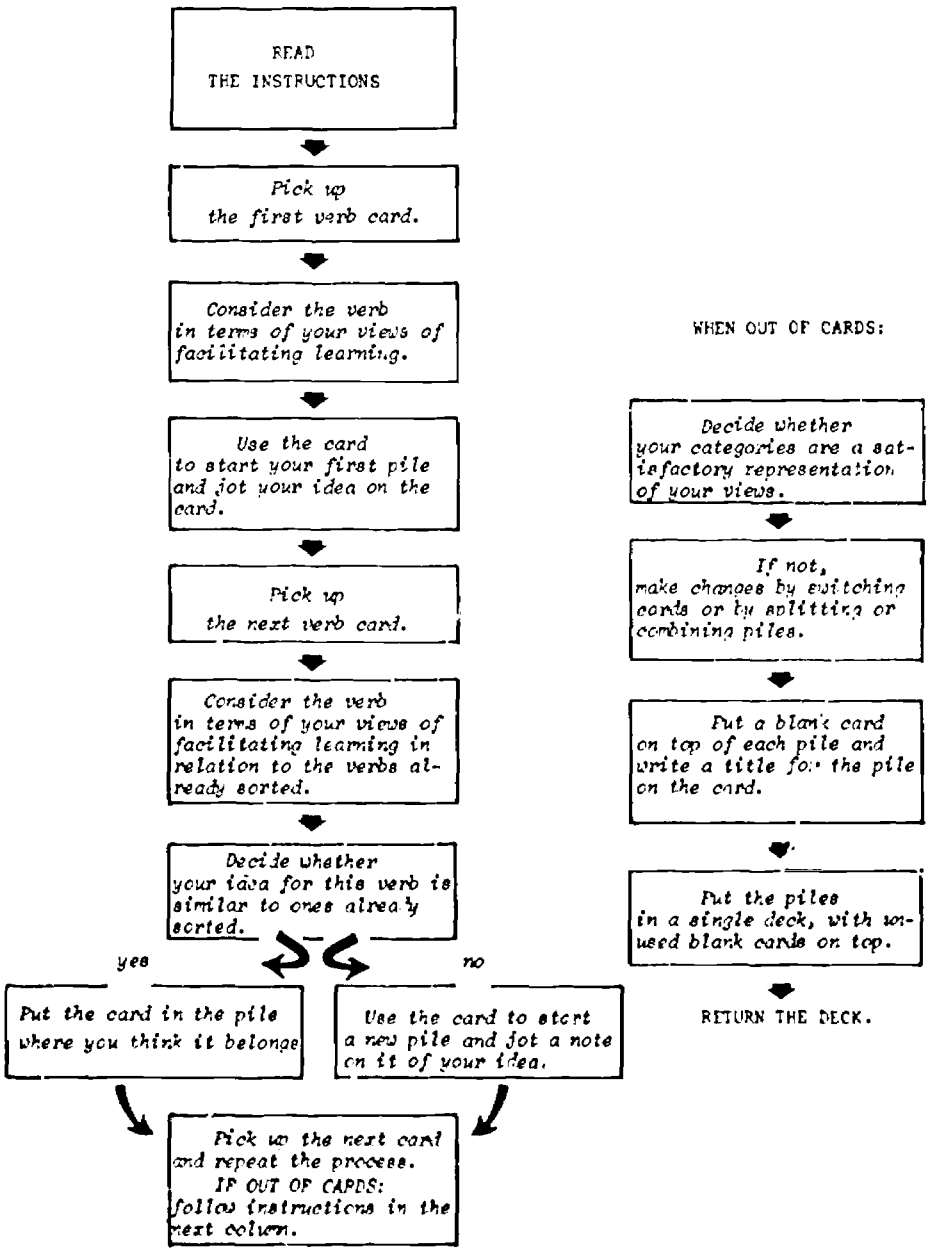


Figure 6.2 Flowchart of instructions for sorting verbs.

b. EXPERIMENTATION WITH VERB SORTING

The remainder of this chapter explains the three verb sorting experiments which were conducted. Detailed specifications of their operations, purposes, and results are given in Chapter 13. The discussion here centers on the theoretical developments which were made in order to analyze the new data. The discussion begins with an explanation of the extended analysis of the data from Sorting Experiment 3. These computations, as noted above, were exploratory and experimental work; they were not definitive because of the small sample sizes involved. In general, the goal was to obtain measures and correlates of individual differences in sorting.

Extended Analysis of Sorting Experiment 3

As noted, individual sorter variation is accounted for in the latent partition model primarily by the latent category confusion probabilities. It is explicitly assumed that sorters differ in their confusion probabilities, so subpopulations of sorters within a defined population may be expected to have characteristic levels or patterns of confusion probabilities. If a latent categorization is adequately determined for a group of sorters, the latent categories will suffice to describe any subgroup, though the confusion probabilities averaged for the subgroup may not be identical with the same probabilities averaged for the total group. Suppose that S is the joint proportion matrix computed for the total group and that S_i is the joint proportion matrix computed for a subgroup. An LPA resolution for the total group appears as:

$$S - \Delta^2 = \Phi \Omega \Phi' ,$$

where Δ^2 is the diversity matrix for S, Φ is the latent category matrix, and Ω is the confusion matrix for the total group. To estimate the confusion matrix averaged over the subgroup, the following equation must be solved for Ω_i ,

$$S_i - \Delta_i^2 = \Phi \Omega_i \Phi'$$

where Δ_i^2 is the diversity matrix for S_i and where Ω_i is the confusion matrix averaged over the subgroup defining S_i. If Δ_i^2 is estimated, then Ω_i may be estimated by the method of least-squares:

$$\Omega_i \doteq \Phi^{*\prime} (S_i - \Delta_i^2) \Phi^{*} ,$$

where Φ^* is the pseudo-inverse of Φ . If there are several subgroups, then the computations may be repeated, and several Ω_i matrices will be obtained.

The sorters for Sorting Experiment 3 had been selected according to a hierarchical stratification of the defined population of full-time elementary school teachers in Wisconsin. These sorters could be divided according to grade level taught (1-3 versus 4-8) and according to number of years of teaching experience (1-11 versus 12+). By the technique described above, separate confusion matrices were determined for each of the marginal subgroups: primary grade level, intermediate grade level, low experience, high experience. There were observed systematic differences between the probabilities for these four groups. It was apparent that the confusion for some of the pairs of latent categories could be traced to particular kinds of sorters; and it was apparent that one group (primary grade level) had systematically higher confusion probabilities.

Verb Sort I: the Psychological Correlates of Sorting

The immediate substantive issue which arises from considering the verb sorting experimental technique is whether the number and variety of a teacher's categories are more a function of his basic cognitive characteristics than they are of his specific perceptions of teaching and facilitating learning. Do psychological measures not dependent upon the subject matter of teaching account for the variation among teachers' categorizations of teaching-relevant stimuli? A similar question arises concerning the personal and professional characteristics of a teacher. The Verb Sort I experiment was conducted to provide some information on the correlation between (1) personal and professional characteristics of teachers, (2) basic cognitive style measures of teachers, and (3) measures of the number, variation, and substance of categories resulting from teachers' verb categorizations. The details of the sample of sorters, the variables, and the results are presented in Chapter 14. There were ten variables in all: three measures of personal and professional characteristics, two measures of cognitive style, and five measures of sorting behavior. The correlation matrix was computed, and a factor analysis of it was performed to make clear the differentiated relationships among the variables. Significant relationships were observed between and among the personal and professional characteristics and measures of cognitive style, and significant relationships were observed within the measures of sorting behavior. But no significant relationships were observed between the set of sorting behavior measures and the other two sets. The conclusion is that the measures of sorting behavior are not correlated with the personal and professional or the cognitive style measures.

Of special interest here are the sorting behavior measures that were constructed. To utilize the full range of responses obtained with the other measures, it was desirable to obtain individual sorting measures for each subject in the experiment. Of the five measures developed, four were simply related to the category sizes that the sorter produced; in fact, the four measures were the mean, standard deviation, skewness, and kurtosis of category size. The mean, of course, is inversely related to the number of categories, since the number of verbs was fixed. These four measures are purely "sorting behavioral" in that they are not directly related to the substance of categories. The fifth measure, called "Prototypic Discordance," was designed to measure the extent to which the composition of a sorter's categories differed from the composition of the latent partition. It is formally defined as the sum of squares of the differences between the entries of the lower off-diagonal triangle of the joint proportion matrix for the sample and the corresponding entries of the joint occurrence matrix for a sorter. In this complicated sum of squares, a large weight is given to a sorter if he puts together verbs which are rarely put together by other sorters or when he puts in different categories verbs which are usually put together by other sorters. Thus a high sum of squares is a function of content variation, and it indicates a lack of concordance with the other sorters. Because the prototypic discordance measure depends on putting together particular verbs in conjunction with whether the other sorters found them alike, the measure is related to the substance of the sorter's categories. The entries in the joint proportion matrix are a direct expansion of the confusion probabilities for the group; if a sorter has a large prototypic discordance score, it is inferred that he has made many verb assignments which are not probable according to the average confusion probabilities. That is, the sorter has confusion probabilities which differ from the average confusion entries. The measure is found in this sample to correlate with mean category size and with variance of category size; the mean of the measure is about 190 and the variance is about 73. Further use of all five measures was made in the next verb sort experiment.

Verb Sort 2: Studying Changes in Perception

Another primary substantive question concerns whether the categories formed by a sorter are stable over time. Is the categorization that a sorter manifests at a particular time merely a whim of the moment or does it reflect qualities which are unique and static in him? The latent partition model does not specify that a sorter should, under repeated sorting, always form the same categories; rather it specifies that the sorter derives his categorization each time according to confusion probabilities which are unique to him and stable across time. These confusion probabilities determine the pattern and not the exact specification

of the categories that the sorter forms.

To examine constancy and change over time, a sample of student teachers was given the verb sort procedure before their internships and then eleven weeks later, after their internships. The details of the sample, the administration, and the results are explained in Chapter 14. The sorters did not form the same categories both times, but there are indications of a general effect over time--presumably a function of the teaching experience--and of some constancy in the individual sorters' categorizations.

The initial analysis of Verb Sort 2 utilized the measures of sorting behavior developed for Verb Sort 1. For each sorter, twelve measures were computed. Eight of these measures were the moments of category size, taken 'before' and 'after' the teaching internship. The other four measures were prototypic discordance measures: the before categorization compared to the before joint proportion matrix, the before categorization compared to a combined before and after joint proportion matrix, and the two corresponding measures for the after categorization. The intercorrelations were computed for these twelve variables and a factor analysis was produced for displaying their differential relationships. Four factors emerged and they were clearly structured: two factors before were paralled to two factors after. Significantly, each pair of before/after parallled factors was correlated, indicating that some basic individual inclinations in the sorting task are constant over time, even with an intervening treatment. But the mean category size was significantly larger for the after data than for the before. This indicated change and suggested further analysis.

A Latent Partition Analysis of the combined before and after data was performed, and separate confusion matrices were determined for before and after. Of the higher confusion probabilities, each average for the after categorizations was higher than the corresponding average for the before categorizations. But there appeared to be no changes other than this general difference in level of probability; the pattern of confusion probabilities was essentially the same. An attempt is made in Chapter 13 to interpret this general increase in confusion after the internship teaching experience.

Verb Sort 3: The Perceptual Frameworks of Different Kinds of Teachers

A third substantive question concerns whether teachers working under different organizational conditions differ in perceptual structure. A series of evaluation meetings of the staffs of school districts participating in the Wisconsin Improvement Program provided an opportunity to administer the verb sort experiment to a large number of teachers and teacher interns. (Elementary and secondary teachers and interns participated, but only the elementary data are reported here.) The group of sorters consisted of teachers and interns; furthermore, each teacher or intern was in either a team or a non-team organizational situation. The LPA computations were executed on the combined group of sorters, and separate confusion matrices were computed for each subgroup and for the marginal subgroups of teachers and interns. Specification of the sample, the administration, and the results are presented in Chapter 13. No substantial differences were observed between teachers and interns as a whole, nor between team and non-team teachers. However, non-team interns were found to have uniformly higher confusion probabilities than team interns. Further discussion of this phenomenon is presented in Chapter 13.

In computing the LPA results for this data, a slight modification of the LPA computational scheme was employed. The number of latent categories selected for analysis was larger than that indicated in the preliminary LPA outputs. In anticipation of substantial differences in the pattern of confusion probabilities across the subgroups, it was decided to have small latent categories so that the pattern differences would be more clearly interpretable. However, the pattern differences failed to materialize, and the latent categories are unnecessarily fine. That is, while they are a sufficient set of categories for representing the latent categories of the sorters, it is not necessary to have so many categories. It is interesting to contrast this set of latent categories with those presented for Verb Sorts 1 and 2.

CHAPTER 9

CONSTRUCTING QUESTIONNAIRES FOR INVESTIGATING VIEWPOINTS

The development of three ancillary studies using conventional questionnaire procedures are presented in this chapter. Described in the first and second sections are two studies conceived as alternative approaches to the categorization methodology for the investigation of teachers' views concerning the facilitation of learning. Both studies involved the preparation of questionnaires according to a priori item definitions and the measurement of teachers' perceptions by means of a seven-point response scale rather than by a qualitative technique such as the sorting procedure. It was expected that the information resulting from these studies would be of a different kind than the knowledge obtained by use of the categorization methodology. The third section of the chapter describes the construction of a questionnaire for measuring teachers' instructional cooperation.

a. QUESTIONNAIRE ITEMS DEFINED BY MANIPULATING CONTENT UNITS

Categorization methodology provided an approach to the explication of teachers' views. In this approach, the substance and structure of the explication received maximum input from teachers' perceptions and cognitions. Categorization methodology severely restricted the influence which non-teachers, including the researchers, could exert. To investigate the effect of imposing substance and structure based on a priori considerations, the researchers manipulated teacher-described content units to transform a set of stimulus units into a questionnaire of a kind frequently used in observing and rating teacher behaviors.

Several investigators in the field of education have used such questionnaires to investigate teacher-learning behavior in the classroom (Ryans, 1960; McGee, 1955; Michels & Helson, 1949; Hunt & Volkman, 1937). These questionnaires, usually consisting of several items written from a theoretical or logical base, are arranged in a random order and presented to the respondent. The measurement of responses to these items often takes the form of a Linkert-type scale such as: 1) strongly agree, 2) agree, 3) neutral, 4) disagree, and 5) strongly disagree. The directions usually require the respondent to register the extent of his agreement with the item by circling a point on the scale. It is important to note that the reactions of the respondent must be filtered through the scale and that, whether or not the respondent agrees the item, the item may still be a very efficient way to accomplish a required end. For example, an item on

a political attitude questionnaire might read: "It is always best for a political candidate to be on intimate terms with the political machine of his ward." A respondent to this item might disagree violently with the statement involved and yet the item may describe the only way for a political candidate to get elected in a particular city. The point is that the type of scale used to measure responses to a questionnaire is dependent upon the results desired. If one is interested in measuring the efficacy of a practice with a questionnaire item, then one must devise an appropriate scale.

There are many ways to write or construct an item to be used in a questionnaire. Techniques for item-writing are based on criteria, either implicit or explicit, which item-writers develop with practice in their art. According to Ebel (1951) "In actual practice item ideas are seldom formally stated. Usually they exist only temporarily and with no verbal explicitness in the mind of the writer."

The main purpose of the entire project, that of explicating teacher viewpoints, dictated that the approach to item-writing be goal-specific. There were conventional restrictions placed on the experimental procedures described in this chapter. The authors felt that a certain degree of scientific rigor could be applied to item-writing procedures per se. Accordingly, the following criteria for item-writing evolved:

Criterion	
1. Meaningful	From the viewpoint of the classroom teacher the items should be meaningfully stated in terms of real classroom situations.
2. Behavioral involvement	Item situations should involve some actions or interactions of teachers and pupils and, if possible, a reason for the actions.
3. Learning oriented	Actions reflected in the items should be relevant to change or potential change in pupil behavior, thereby signifying relevance for learning.
4. Generalizable	The situation and item should be stated so that any teacher reading the statement could identify with that situation in terms of teaching behavior.
5. Valid	Item content should be validated by using statements of teachers concerning the realities of the classroom.
6. Continuous scale	A continuous scale with specified alternatives should underlie the options for responding to items.

These criteria were observed in developing items for an inventory. For example, in criterion six above, the specifications for an adequate scale evolved from the belief that general statements of the

the continua were unacceptable, i.e., the continuum

Agree ——— to ——— Disagree

would be considered unsatisfactory. The specification of a specific continuum, however, is relatively simple. For the continuum of agree-to-disagree, the specification can be made as follows:

Agree that this will facilitate learning	to	Agree that this will not facilitate learning

The need for such specification is illustrated by the fact that scales described in general terms are ambiguous, and the underlying criteria for any judgment is unclear on such scales.

In constructing conventional items, the typical procedure is to acquaint a subject-matter expert with the research goals and to have him write the items. However, to make the inventory correspond to the sorting experiment as much as possible, it was decided to use the same content units as were used in the sorting activities to generate inventory items. Keeping in mind the criteria and given the desire to use comparable stimulus material, the researchers could construct items according to the following steps:

Purpose	Procedure
1. Identify sets of content units	Examine output of LPA[1] and note homogeneous clusters of content units (LPA categories).
2. Identify key points of each content unit	Deduce the meaning of a content unit in terms of relevant teacher practices and underlying learning issues.
3. Construct items	For each content unit write at least one item. It may be necessary to refer to the interviews to provide material for the situational context of the item.
4. Summarize homogeneous groups of items	For all items whose stimulus units load on a particular LPA category, determine the dimensions of common meaning for possible use in constructing artificial (non LPA) items.

[1] Latent Partition Analysis. See Chapter 7 and Appendix G.

Construction of an Item

Content units from pilot sorting experiments were used as stimuli for the generation of situational items. Situational items use the content unit as a nucleus but are embedded in a situational context detailing some example of classroom behavior. The situational items were written by an experienced teacher on the basis of his perceptions of how the content units related to actual classroom situations. From these situational items (approximately 100), those derived from the content units contained in the LPA were selected for review.

Figure 9.1 is an example of a content unit and the situational item constructed from it. This item was actually used in the Inventory.

Content Unit

This teacher, as a means of punishment, will give a student an extra assignment such as a report on a certain subject or person to be completed during recess when the others are privileged to be outside playing.

Situational Item

Miss Roberts gives pupils extra assignments as punishment for misbehavior. She requires that the assignment be completed during recess when the other pupils are outside playing.

"Don, you are to stay in this recess and write a report on the life of Thomas Edison. Maybe this will help you to learn to control your tongue."

In this situation the practice of giving an assignment for disciplinary purposes.....

Embedded stimulus unit
This section repeats, with as little change as possible, the essential characteristics of the blocked item.

Situational context
This section relates the described activity in personal terms to attempt to create respondent empathy.

Charge
This section summarized the activity and directs the respondent to consider his answer in terms of the facilitation of learning scale.

Scale

0	1	2	3	4	5	5
Does Not Facilitate Learning		Slightly Facilitates Learning		Moderately Facilitates Learning		Greatly Facilitates Learning

Figure 9.1 Anatomy of an Item from the Inventory of Classroom Learning Situations

After all the situational items were written, they were evaluated by the project staff on the basis of fidelity to the content unit, correct English usage, and clarity. The situational items were then returned to the teacher-author who revised or eliminated them. The final result was a series of situational items, relatively clear of ambiguities, which represented the content units derived from the 15 LPA categories.

Inventory Model

The situational items were applied to an inventory. Analysis of 100 blocked items resulted in 15 latent categories within which the content units were grouped. To obtain an item pool for the inventory, several of the highest loading content units were chosen from each latent category and used as stimulus units for the construction of situational items.

There were some LPA categories which had few high-loading content units and thus were not distributed evenly across latent categories. The optimal number of items for the Inventory of Classroom Learning Situations (ICLS) was judged to be 50, and since elimination of some items had reduced the pool of useable items to less than 50, the item pool had to be increased in two ways:

1. Some items were developed from content units which had never been included in a sorting experiment or a Latent Partition Analysis.[1] Each item which was based on one of these analyzed content units was assigned logically to a category of questionnaire items on the basis of its content.

2. A few situational items were constructed from content units which either did not load highly in any category or had relatively high loadings on more than one category.

Two situational items were randomly assigned to each page of the inventory, and instructions for respondents were given on the first two pages. See Appendix I for the instructions and sample items from the inventory. The instructions were conventional, and were designed to impart a set for "facilitation of learning," the same set that the researchers attempted to impart to the sorters.

[1] All 32 recorded interviews had been converted by means of the judging-blocking content analysis routine, and such a large quantity of content units could not all be included in the sorting studies.

b. DESIGNING QUESTIONNAIRE ITEMS ACCORDING TO A PRIORI FACTOR DEFINITIONS

The previous section described one approach to imposing logically derived substance and structure on teachers' perceptions. A second experimental study was developed for further investigation of the imposition of substance and structure. This study involved the construction of a questionnaire in which the items were derived by considering interviews, content units and literature on classroom teaching as source materials for the logical definition of substance and structure. The questionnaire which was developed used the same response scale as the Inventory of Classrom Learning Situations described in the previous section.

As an alternative and simultaneous approach to the systematic explication of teachers' classroom teaching behavior, a search was made for factors[1] affecting teacher behavior which could be molded into items for an inventory constructed according to a factorial design. The question under study was: Can items be constructed so, that the results may be analyzed according to a factorial ANOVA?

The authors thought it desirable to develop such an instrument, and the Inventory of Teacher Practices and Learning Situations (ITPLS) evolved. The empirical work in the development of ITPLS involved developing a set of test items which were descriptive of different classroom situations and structured in terms of a complete factorial design. Items developed from this viewpoint may be regarded as experimental treatments. When a questionnaire is planned according to an experimental design, statistical analysis of the main and interaction effects of the defined factors is possible.

The research procedures for developing ITPLS involved four steps: 1) defining factors, 2) designing the inventory and item types, 3) constructing test items and a test inventory, and 4) administering the inventory to two groups of subjects.

---

[1] Factors refers here to constructs defined prior to experimental manipulations, not to the dimensions which are derived through the use of factor analyses.

Selecting Factors

From the consideration of teacher interviews, teaching experience, and relevant literature, four selected major sources of variation were hypothesized to influence classroom learning situations and teaching practices. These sources of influence are (a) the grade level of the class of pupils, (b) the subject matter being taught, (c) the teacher's approach to instruction, and (d) the method of instruction.

Designing the Inventory and Item Types

Having determined the general boundaries of the factors, the researchers possibly conceptualized two distinct and meaningful levels of each of these four factors. Consequently, a total test inventory was designed according to a complete 2^4 factorial experiment in which each item was a "treatment" specified by combining levels of each of the four factors. Structured in this way, the total inventory consisted of $2^4 = 16$ treatments, or item types.

The following plan was used in defining the factors, and levels of factors:

Factor	Level A	Level B
1. Grade level	First grade	Sixth grade
2. Subject matter	Skill learning	Content learning
3. Teacher approach	Teacher-centered	Pupil-centered
4. Teaching method	Drill	Discovery

Grade level (Factor 1). The levels of this factor, the first and sixth grades, were chosen because they are the extremes of the elementary grades. Using extremes maximized the opportunity to observe any differences in teachers' judgments that might occur as a result of variations due to grade level.

Subject matter (Factor 2). This factor was divided into two levels on the basis of whether the subject-matter area involved the acquisition of a skill or the learning of subject matter content. Subject matter involving skill learning arbitrarily included arithmetic, social studies, and literature. To reduce the likelihood of bias that might be associated with a specific subject matter area, each subclassification was included approximately the same number of times; the particular subclassification for any subject-matter item was assigned randomly.

Teacher approach (Factor 3). The teacher-centered approach and the pupil-centered approach were distinguished as levels of this factor on the bases of the locus of control of the activity described in the item and the direction of the described pupils' attention. In the teacher-centered approach, the locus and direction were oriented to the teacher; in the pupil-centered approach, the locus and direction were oriented to the pupil.

Teaching method (Factor 4). Level one of this factor was drill or rote learning activities; discovery, the second level, referred to attempts by the teacher to develop pupil understanding through procedures aimed at stimulating insight without recourse to rote memorization or rigid learning routines.

The final decision in completing the experimental plan was to specify the number of items to be written for each item type (treatment) of the inventory. The objective here was to obtain a stable estimate of the mean response for each item type while keeping the inventory reasonably short. On the bases of reliability and the time required for test administration, four replicates were written for each item type.

Constructing Test Items

Once the factors were defined, two tasks remained for the completion of the inventory: a) a listing of several statements for each factor level which would provide alternatives for the final substantive preparation of the items, and b) a scheme by which each item could be uniformly drafted and completed so that teachers could respond to the whole item in a meaningful way. The content of each inventory item was selected from a tentative list of statements corresponding to each of the 16 item types. The lists were developed by surveying the results of interviews with teachers, by visiting classrooms, and by analyzing the content of the proposed items with an experienced teacher.

The scheme for writing each item into a total stimulus unit caused some initial difficulties. The structure which evolved contained four parts corresponding to the four factors. The structural anatomy of one item is presented in Figure 10.2, where the underlined information indicates the levels of the factors specified for Item Type 16, that is, sixth grade, content-learning subject matter, pupil-centered approach, and discovery method. Each responding teacher was asked to make a judgment, based on his own experience, on each item in terms of the situation described and its effect on the facilitation of pupil learning. This judgment was made on the seven-point response scale, on which '0' indicated no facilitation of learning and '6' indicated great facilitation of learning. Appendix J contains the instructions for and other

sample items from ITPLS.

	Factor	Level	Inventory Item
I.	Grade level	2. Sixth grade	A sixth grade teacher is conducting a science lesson on concave and convex lenses. On the science table is a display of lenses.
II.	Subject matter	2. Content learning	
III.	Teacher approach	2. Pupil-centered	The teacher's instructional procedure is to have small groups of pupils work together trying to figure out the different effects of the two lenses.
IV.	Teaching method	2. Discovery	Her puspose is to enable the pupils to gain insight into the principles of refraction.
	(Response Stimulus)		In this situation, to what degree will this teaching practice facilitate pupils' learning?

Scale

0	1	2	3	4	5	6
Does Not Facilitate		Slightly Facilitates		Moderately Facilitates		Greatly Facilitates

Figure 9.2 Anatomy of an item from the Inventory of Teaching Practices and Learning Situations (Type 16).

c. A MEASURE OF TEACHERS' INSTRUCTIONAL COOPERATION

A major reason for initiating the project was the need for investigating the influence of different kinds of staff organizations on teachers' views concerning the facilitation of learning. In particular, it was expected that teachers working in instructional teams would have different views of facilitating learning than would teachers instructing in non-team teaching staff organizations.

Two basic difficulties were encountered in designing such a comparative study. One difficulty was the need for defining a basis for unbiased comparison of the different kinds of teachers, the solution to which was the development of categorization methodology. A second difficulty was the need for distinguishing between teachers working in team-teaching staff organizations and those working in non-team organizations. This difficulty existed primarily because most teachers feel they are members of a staff team, and that they do work to some extent, with other teachers. A survey of the literature on the characteristics and definitions of instructional teams strongly suggested that collaboration among teachers was more precisely conceived as a continuum of cooperation than as a distinction based on staff organization characteristics. Even in teaching teams, teachers often engage in classroom work independent of other teachers. For these reasons, an empirical approach was needed for measuring the extent to which teachers engage in cooperative activities. The results of such an approach would be used to investigate relationships between instructional cooperation and teachers' views of facilitating learning.

The development of a measure of instructional cooperation was begun by listing the kinds of daily activities of teachers which indicated the sharing of instructional responsibilities, the coordination of teaching activities, the collaboration of teachers in the planning of classroom instruction, and other ways in which teachers provide assistance to each other. Based on this list, a series of twelve behavior-specific questions were constructed. Each question asked whether or not a teacher engaged in a particular activity with cooperation from another teacher. For example, three of the questions were:

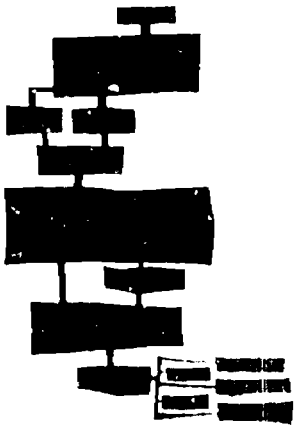
> During the past two weeks has another teacher outlined and described a lesson for which you will be responsible?
>
> During the past two weeks did you jointly conduct a lesson with another teacher?
>
> Think over the last time you filled out report cards. When assigning grades to each of the pupils, did you consult with anothe

Teachers were asked to respond by circling "yes" or "no." This form of answer emphasized the factual nature of the questions rather than requiring judgmental responses which would have been implied by the use of a multiple choice scale. For example, if a teacher responded "no" to an item, this would indicate that the teacher had not engaged, during the specified time period in such an activity with another teacher. By evaluating the meaning of "yes" and "no" responses to each of the twelve questions, it was possible to construct a scoring key according to which a high total score on the questionnaire indexed a high degree of instructional cooperation for the respondent. The scoring key consisted of coding a "1" for the response which indicated instructional cooperation and a "0" for the response which indicated independence of action. Consequently, a single index of cooperation could be derived; the maximum value was 12 and the minimum value 0. This questionnaire was titled Instructional Cooperation Questionnaire[1] (ICQ) and may be found in Appendix K.

The differences between two dissimilar approaches for researching teachers' views should be mentioned. In the first--a priori--approach, which is most commonly used to observe human behavior, investigators are not attempting to discover how subjects uniquely order their world; but rather they attempt to ascertain how well the subjects fit into a structure defined a priori by the investigators. In the second--a posteriori--approach, which is characteristic of LPA and the sorting procedures of this project, subjects manifest their unique perceptions and the order of their worlds. The attempt here, then, is to identify that order perceived by the subjects

Each of these approaches would seem valid for examining the substance and structure of teachers' viewpoints. Would the utilization of the same substance in the a priori and a posteriori approaches yield the same results? It was precisely this question which prompted the development of the ICLS and ITPLS instruments. That is, will superimposing structure by means of a questionnaire result in responses to content which are similar to responses exhibited in situations where no structure is imposed? The results of experiments comparing the ICLS, the ITPLS, and the various sorting experiments will be discussed in Chapter 14.

[1] The ICQ appears to be a useful index of instructional cooperation (see Chapter 14). However, it has been revised, and the improved version should be used in further studies. Copies are available from the Instructional Research Laboratory, University of Wisconsin.



PART III

Substance and Structure of Teachers' Views

CHAPTER 10

RESPONSIVENESS OF INTERVIEWEES AND CONTENT UNIT PRODUCTION

The purpose of this chapter is to present data analyses related to the major interview study and to the content summarization of the corresponding interview recordings. The final interview study involved interviews with 32 teachers (all conducted by the same two interviewers). Teachers were selected according to the two-stage, stratified, random-sampling plan, (Chapter 5, Section C) which involved selection of interviewees according to a fractional-factorial design including six factors characterizing school districts, and 3 factors characterizing teachers. Three additional factors determined the organization of the interview. This design served two purposes: 1) the unbiased selection of teachers and of the interview schedule to be used in a particular interview, and 2) a framework for economizing data summarization and analysis. Due to limited resources, only the first hour of each of the 32 interview recordings was summarized and analyzed.

The content units obtained by analyzing the first half of each of the 32 interviews defined a finite sample of the theoretically infinite content domain. This sample--of content units -- was used in the major sorting experiment which is detailed in Chapter 12.

This chapter will present three sets of analyses: 1) the interview process, 2) summarization of the interview materials into content units, and 3) the productiveness of interviewing in terms of related teacher characteristics. The goal of the interview methodology was the production of content units, and this was the goal which determined the development of the final interview schedules. The following data are essentially descriptive and exploratory, but they do provide empirical referents for evaluating the effectiveness of interviewing.

a. CHARACTERISTICS OF THE INTERVIEWING PROCESS

Focused free-response interview techniques and schedules were designed to establish conditions under which teachers could talk freely about their views of teaching and learning. Consequently, the two interviewers endeavored to minimize the extent to which they talked during the interview, and they limited the functions of their speaking to stimulating and directing the interviewee's discussion. Data concerning this verbal interaction were gathered by measuring the length of time talked and the frequency of talking by the teacher and by each interviewer. The lengths of silence attributable to each were also

measured. These measurements were made by using two stop-watches while listening to a tape-recording. The duration of talk or silence attributable to the Leading Interviewer (I_A), the Supporting Interviewer (I_B),and the Teacher (T) were observed in sequence and noted on a record sheet.

Source	Time Segment 1		2		3		4		5		6	
	Talk	Silence	Talk	Silence	Talk	Silence	Talk	Silence	Talk	Silence	Talk	Silence
Interviewer (I_A)	10				5	(1)						
Interviewer (I_B)									3	(1)		
Teacher (T)			25	(3)			20	(1)			30	(1)

Figure 10. A record for talk and silence segments in part of an interview (measured in seconds).

The entries of this record sheet are sequentially arranged according to the segments of time talked. Silent pauses are noted in parentheses and correspond to the segment of talk during which they occurred or which they followed. The sequence of interaction shown in this example is:

1) I_A talked for 10 seconds.
2) T talked for 25 seconds; a 3 second pause or silence was included.
3) I_A talked for 5 seconds; a 1 second pause was included.
4) T talked for 20 seconds; a 1 second pause was included.
5) I_B talked for 3 seconds; a 1 second pause was included.
6) T talked for 30 seconds; a 1 second pause was included.

These provide information necessary for defining three variables characterizing the verbal interaction process between an interviewee and two interviewers. The variables are 1) frequency of response, 2) duration of response, and 3) percent of response. These variables can be used to characterize the verbal behavior of each of the three interview participants.

For describing and documenting the final interviewing technique, selected tape-recordings were analyzed according to this scheme, and the interrelationships among the three variables were studied. Because the development of the basic record sheet (Figure 10.1) and the derivation of the three variables mentioned above were extremely time-consuming, a random sample of 16 tape-recordings was taken from the

available 32. The measurements were made only during the first segment of the interview, during which the first of the two schedules was being followed; the interview preparation period and the termination period were excluded. The summary of interview characteristics is given in Table 10.1.

TABLE 10.1

SUMMARY CHARACTERISTICS OF SIXTEEN INTERVIEWS

Source	Average Number of Times Talked	Longest Response [1]	Average Time Talked [1]	Standard Deviation of Time Talked [1]	Average Percent of Time Talked
Interviewer I_A	54.6	1.07	5.86	1.90	11.8
Interviewer I_B	24.2	.33	1.56	.68	3.1
Teacher	77.1	10.33	44.35	9.39	85.1

[1] Measures are in minutes

Teachers talked on average of 44.34 minutes per hour of interview time, while the Leading Interviewer averaged 5.86 minutes and the Supporting Interviewer averaged 1.56 minutes. The patterns of length of time talked and percent of time talked indicate the success of the interviewers in allowing the teachers to dominate the discussion. The difference in talking time between the interviewers reflects the fact that I_A was responsible for initiating and directing the discussion, while I_B played a supporting role. The differential pattern of verbal interaction is not as apparent for the average number of times talked. This indicator revealed that I_A talked an average of 54.6 times per segment, I_B talked 24.2 times, and the T talked 77.1 times per segment. The interviewers talked frequently but briefly to stimulate and direct discussion. Teachers talked not only more frequently but also for comparatively greater lengths of time.

Frequency and Duration of Response

For all 16 selected interview recordings, a total of 2,495 segments of discussion were examined for information on topics listed in the interview schedule. These segments represented approximately 15 hours of time which included about 4.5% silence or pause periods. Since the silent periods were of little relevance in terms of the ultimate purpose of the interview, production of content units, and since these periods occupied only six percent of the time, they were omitted from further analyses. However, the

relationships between the percent of silent periods per interview and the three other variables were determined. The intercorrelations are given in Table 10.2.

TABLE 10.2

INTERCORRELATIONS OF PERCENT SILENCE AND THREE OTHER INTERVIEW VARIABLES

N = 16

Interview Variables	Percent Silence Per Interview
1. Total time of talk per interview	.17
2. Percent of time talked by interviewee	.33
3. Number of Content Units per interview	-.17

The percent of silence per interview was only marginally related to the other three interview variables.

The frequency and duration of talking by interviewees and by interviewers were further studied by preparing frequency tabulations of the segments of talk per interview. Using eight-second intervals, frequencies were tabulated for I_A, I_B, and T. These tabulations were averaged and a summary is given in Figure 10.2.

Figure 10.2 indicates that the interviewers talked most frequently in short intervals, while the interviewees talked for longer periods. The two interviewers talked most often in 4-second lengths. I_A talked for more than twice as many 4-second lengths as I_B, and both talked more than twice as often in 4-second intervals than any other time length. The maximum length of time, with one exception, talked by I_A was about 36 seconds, and 97% of his utterances were less than 20 seconds in length. No response of I_B was longer than 20 seconds. Though T's also responded with greatest frequency in 4-second segments, many of their responses occupied time intervals up to one minute in length. In one interview, a teacher talked without pause or interruption for ten minutes. Comparison of the distributions in Figure 10.2 indicates that in an average interview the interviewers talked frequently but briefly, while the teachers talked in widely varying time intervals. About 65% of T's' responses were one minute or less in length.

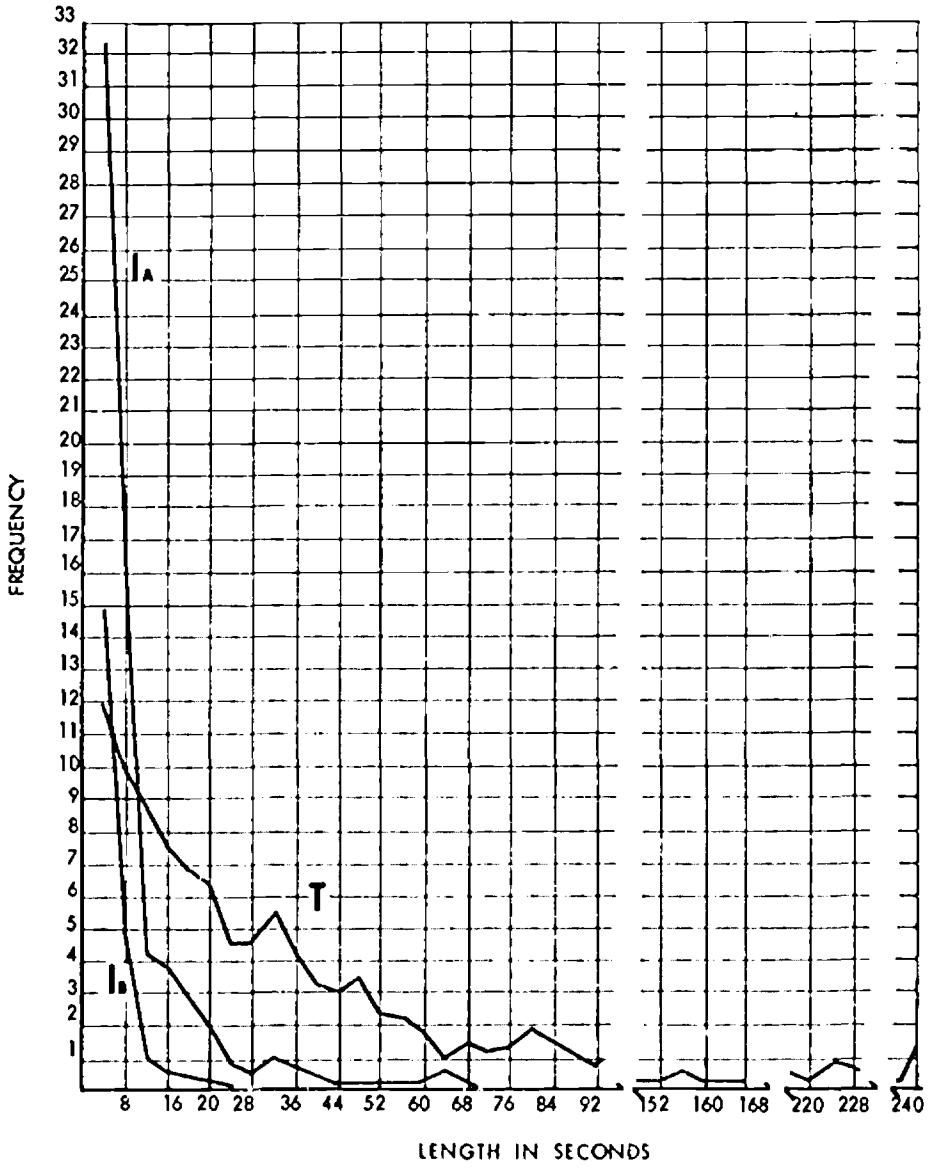


Figure 10.2 Lengths and frequencies of interview responses by Leading Interviewer (I_A), Supporting Interviewer (I_B), and Interviewee (T).

The patterns of interrelationships suggested by observations were further studied by calculating the intercorrelations of the total time talked and the number of times talked by the two interviewers and the interviewees. These intercorrelations are given in Table 10.3. The pattern of significant correlations seemed to center around two variables, the number of times the teacher talked, and the number of times I_A talked. The frequency with which T talked was positively related to all of the interviewer variables, but the total length of T's discussion was negatively related or not related to all variables except total length of the interview. The number of times I_A talked was negatively related to total length of the interview and to the total T talking time. Since the goal of the interview was to produce content units, further explanation of these relationships is delayed until measures of content unit production are introduced. This occurs in Section C of this chapter.

TABLE 10.3

INTERCORRELATIONS OF LENGTH OF TIME TALKED AND NUMBER OF TIMES TALKED BY THE INTERVIEWERS AND INTERVIEWEES

N = 16

VARIABLES	1	2	3	4	5	6	7
1. Total time talked		97*	-40	-13	-49*	-14	08
2. Total time talked by T			-58*	-35	-65*	-27	-02
3. Number of times T talked				-79*	86*	61*	54*
4. Total time talked by I_A					84*	33	19
5. Number of times I_A talked						23	04
6. Total time talked by I_B							85*
7. Number of times I_B talked							

* $p < .01$

Percent of Time Talked

The intent in designing an interview schedule had been to cover a variety of topics about which interviewees could express their views. During the early interview trials difficulties were experienced in maintaining a consistent level of discussion. This difficulty seemed to arise from frequent changes in thought required as a consequence of including a wide variety of topics in the schedule. Moreover, the endeavor to funnel the discussion from a general introduction to specific descriptions of particular classroom behaviors and events often resulted in interviewer error in the use of probing questions. This caused response hesitancy. Several revisions and modifications were made in the organization of the topics, and the interviewers sought to improve their approach to maintain a consistent level of interviewee response regardless of depth or direction of discussion. These difficulties had been solved prior to the major interview study.

To check on the success of the solutions, basic data records on 16 interviews were analyzed for consistency of verbal response patterns. The data records for the sements of talking time were accumulated into successive six-minute sections. For each of the eight six-minute sections, calculations were made on the percent of time talked by interviewers and interviewees. The percentages were then averaged over all 16 interviews. The results of the calculations are presented in Figure 10.3. A consistent pattern of verbal responses was observed. On the average, interviewees maintained a level of discussion occupying 80-85% of the total talking time. I_A averaged between 10-16% of the total tape time, and I_B varied between 2% and 4%. Significant ($p < .01$) negative correlations were found between the percent of time talked by T's and by the interviewers. The correlation between percent of time talked by T and percent of time talked by I_A was -.97; between T and I_B the correlation was -.68.

c. CONTENT SUMMARIZATION OF INTERVIEW RECORDINGS

In this section data will be presented concerning the performance of the judges and blockers in summarizing the content of interview recordings. Due to limitations of resources, only the first hour of each recording was summarized. Content units produced from these summarizations were used in the major sorting study described in Chapter 11 and 12.

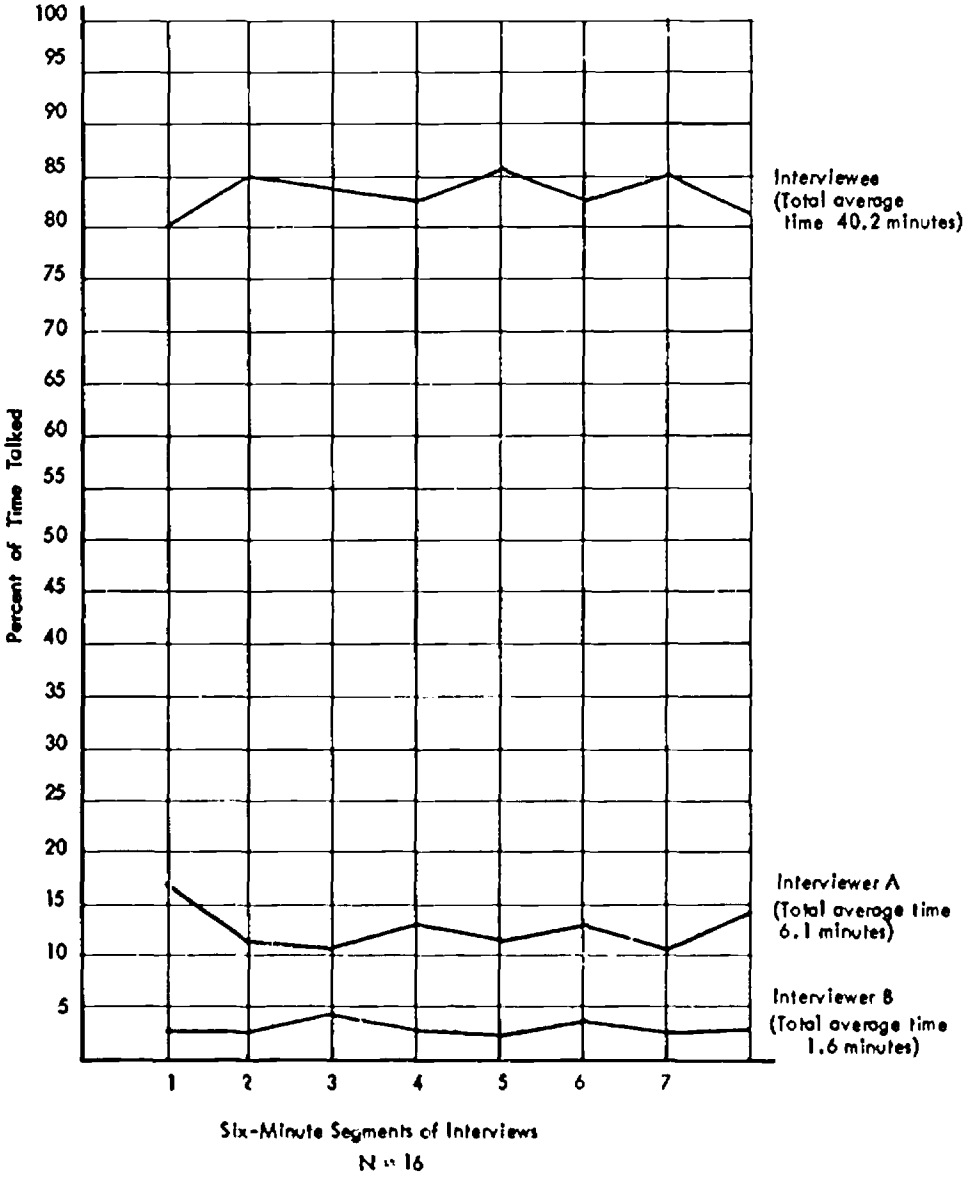


Figure 10.3 Average percent of time talked by interviewees and interviewers.

Performance of the Judges

Four teachers were hired and trained to judge the 32 interview recordings. After training, the teacher-judges were each randomly assigned 16 interview recordings so each recording would be summarized by two judges. The judges then proceeded to work independently and at their own rates.

A judged statement consisted of two parts: a) the action or implied action of the interviewed teacher, and b) the reason for the action. The record sheet format was "This teacher...because...." A total of 4740 such statements were prepared by the judges (Table 10.4). On the average, 81 statements were extracted from an interview. A count of the two parts of the judged statements indicated that an average of 49% of the statements included the second part, or reason section, of the unit.

The results shown in Table 10.4 indicate that for every 51.8 minutes of interview time (see Table 10.1), 2.8 hours were required for a judge to summarize the statements. Incidental comments of the judges indicated that, though the task was very demanding, it was meaningful to them as teachers. Some further information concerning the relationship between judges' performances and other aspects of the interview summarizations will be given later in this section.

Performance of the Blockers

Two teachers were hired and trained to perform the blocking of the interview recordings. As described in Chapter 5, the blockers' job was to listen to a recording and to simultaneously study the corresponding two judges' reports, and to prepare one single listing of content units. After training, each of the blockers was randomly assigned 16 interview recordings and the corresponding judges' reports. (An adjustment later had to be made in assignment of recordings because of personal affairs, see Table 10.6.) Thereafter, blockers proceeded to work independently.

The number of content units and the gross working time of the blockers are given in Table 10.5. A total of 2302 content units were prepared by the blockers. On the average, each interview recording yielded approximately 80 content units. Typically, then, 51.8 minutes of interview time (see Table 10.1) required 71.5 minutes of work by the blocker and resulted in the preparation of 80 content units.

TABLE 10.4

CHARACTERISTICS OF JUDGES' PERFORMANCE
(N = 4 Judges)

	Number of Statements		Gross Working Time[a]	
Interview	Judge One	Judge Two	Judge One	Judge Two
1	58	62	180	180
2	84	57	150	200
3	111	72	220	220
4	117	64	195	195
5	87	68	185	175
6	46	69	170	205
7	89	84	225	178
8	105	87	240	183
9	83	66	184	210
10	64	73	190	150
11	116	63	113	134
12	98	94	210	270
13	91	80	185	170
14	98	78	210	160
15	83	75	194	215
16	63	74	150	188
17	119	66	180	195
18	87	80	190	193
19	63	59	155	170
20	81	51	170	119
21	65	69	185	140
22	73	57	190	170
23	47	64	130	130
24	78	44	110	290
25	43	81	75	130
26	110	71	100	165
27	78	70	222	245
28	57	47	150	105
29	65	77	185	205
30	88	55	108	143
31	48	50	170	190
32	98	40	105	110
Total	2593	2147	5426	5733
Mean	81	67.1	169.6	179.1
Standard Deviation	21.6	12.6	40.3	42.1

[a] measured in minutes

TABLE 10.5

CHARACTERISTICS OF BLOCKERS' PERFORMANCE
(N = 2 Blockers)

BLOCKER A			BLOCKER B		
Interview Number	Number of Content Units	Gross Working Time (Minutes)	Interview Number	Number of Content Units	Gross Working Time (Minutes)
1	63	150	2	73	180
3	84	185	4	95	185
6	62	165	5	84	170
8	85	195	7	98	160
10	70	185	9	95	170
13	66	175	11	84	85
15	69	155	12	108	135
18	58	165	14	107	124
19	51	195	16	76	135
21	50	160	17	68	145
24	44	95	20	79	95
25	34	135	22	76	95
31	42	95	23	54	110
			26	76	102
			27	73	95
			28	66	93
			29	70	100
			30	75	95
			32	67	90
Total	778	2055		1524	2364
Mean	59.8	158.1		80.2	124.4
S. D.	14.80	31.8		14.1	33.5

A substantive comparison of the work of a judge and a blocker with respect to the original interview recordings is given in Figure 10.4. This figure shows a transcription of a segment of a recorded in interview, the two judges' statements, and the content units prepared by the blocker.

A comparison of the average gross working times of the judges and blockers, 2.8 hours and 1.2 hours respectively, indicates that the blocker was able to work more rapidly than the judges. Further study of the relationships among judging and blocking characteristics was made by calculating the inter-correlations of 6 variables. These correlations are given in Table 10.6.

Teacher	Judge 1	Judge 2	Content Unit
I'm not trying to stump these children or keep testing them all the time. That's one thing I never try to do is keep testing them. They're supposed to be learning and I...I expect that they should have it right. I want them all to have it right at the end of the day, but I don't want them to have it right without a complete understanding.	This teacher does not keep testing children or try to stump them.	This teacher never tries to keep testing children. This teacher does not want children to have work right without understanding.	This teacher does not keep testing children or try to stump them because she expects them to have it right at the end of the day, but she doesn't want them to have it right without a complete understanding.
because then I would have gone around and told them the right answer which is what I never, never do; tell them any answers at all.	This teacher never tells students the right answer.	This teacher never tells students any answers at all.	This teacher never tells students the right answer.
But rather he'll say if he asks me, how to do it, then I'll ask him a question, "How do you do it?" or "Let's look at it and see what is the best way to do it."	This teacher asks them the questions which would lead them into the right line of thinking so he would get his own answers.	This teacher answers a question of how-to-do-it with a question or guidance or how to find the answer.	This teacher answers a question of how-to-do-it with a question or guidance of how to find the answer.
Interviewer: How do they know that they're right if you don't tell them any answers?			
It doesn't sound right to them. Well, they're either... when they do come up for questions because they're completely stumped. Maybe it's a word to fit in somewhere in their workbook. Then we'll take it and I will sit down and spend time with the child and figure it out and tell him that every time he notices now that there's an "e" on the end he should find out whether or not it makes the vowel before it say long "a"; that type of thing.		This teacher says the child asks questions because he is stumped.	This teacher says the child asks questions because he is stumped. For example, he may ask about a word; she helps him analyze it so he will understand and know the word or a similar word the next time.
Interviewer: Those children who don't come up how do they find out if they are right?			
Well, I catch that when I walk around, up and down the aisle. See I catch that then and then I can help them individually. No, I'll ask them a question which would lead them into the right line of thinking about what it might be.		This teacher catches mistakes of those who don't ask questions when walking around the room.	This teacher catches mistakes of those who don't ask questions while she's walking around the room.

Figure 10.4 An example of how interview materials were judged and blocked into content units

TABLE 10.6

INTERCORRELATIONS OF JUDGE AND BLOCKER CHARACTERISTICS

Variable	2	3	4	5	6	7	8	9
1. Total interview talking time	-24	-07	12	09	08	16	-38	-42
2. Gross working time, Judge 1		14	36	44	72*	35	59	68*
3. Number of statements, Judge 1			-09	01	03	85*	-06	68*
4. Gross working time, Judge 2				08	69*	-04	-20	06
5. Number of statements, Judge 2					34	53	39	49
6. Average working time, both Judges						20	27	45
7. Average number of statements, both Judges							14	83*
8. Gross working time, Blocker								38
9. Number of content units, Blocker								

* $p < .01$

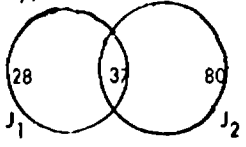
It should be noted that correlations between the number of statements prepared by judges and the number of statments prepared by blockers are inter-trial indices; they are not inter-person indices, for they are not repeated measures. Recordings were assigned randomly to judges. It is misleading to consider these coefficients as reliability estimates. The purpose of having two judges work on each recording (see Chapter 5) was to ensure maximum information extraction. They were not trained to record the same kinds of information in exactly the same way. They were trained only in the goals and mechanics of the judging process. The main goal of judging was to cover the information contained in the recordings. Since this information varied widely, it could be expected that considerable differences would appear in the recorded statements of the judges. It should be noted that the two sets of judgments across the 16 teachers were independent ($r = .01$), while the numbers of content units supplied by both judges were correlated positively with the number of content units prepared by the blocker.

The apparent complete independence of judges' records may seem surprising and, from a reliability standpoint, suspicious. However, the situation should be viewed in terms of principles of perceptions, which would indicate that no two judges will perceive identical elements of information in the same

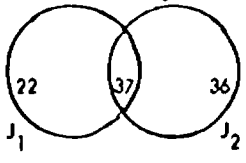
way, no matter how thoroughly judges are trained.[1] The interview recording was considered to be a rich source of information from which could be summarized several different sets of statements. The main reason for using two judges was not to guarantee reliability but to extract as much usable information as possible within the cost limits of the project.

The blocker's task was to consolidate the judges' lists into a single list which would include the common and the unique statements of the judges. The blocker's task was designed to obtain information economically, which would be in highly useful and manipulable form. As mentioned earlier, interview recordings are often literally transcribed before they are analyzed; this usually involves at least 10 hours of transcribing for each recorded hour of interview. The expense of such a procedure can be defended only if there are significant gains in information extraction. As shown below, the judging-blocking procedure was relatively economical while extracting about 80% of the theoretically possible information.

To estimate the percent of information gained or lost by the judging-blocking procedures, an analysis was made of several judges' and blockers' reports. The numbers of statements common and unique to each judge were counted by referring to the blocker's report. For example, for one interview recording Judge 1 (J_1) listed 65 statements and Judge 2 (J_2) listed 117 statements. According to the blocker's report and according to an inspection of the lists by a research staff member, 37 of the statements were common to both judges' lists. Diagrammatically, the situation was:



After the blocker had processed the two lists, many of the judges' statements were omitted due to 1) redundancies and 2) meaninglessness. After the blocking task had been performed, the situation was:



[1] See for example E. L. Kelly's (1947) discussion of the demonstrations of perception at the Fels Institute, page 97.

As shown, the blocker had discarded 4 statements of (J_1) and 44 of (J_2) through condensing the lists and omitting duplicates. Thus 39% of the statements were common to both judges, 23% were unique to J_1, and 38% were unique to J_2. A probability formulation of these data can be used to estimate the percent of information extracted from the interview recording.[1] It is estimated that for this interview recording 81% of the information residing in this recorded interview was extracted.

This analysis of the judging-blocking process indicates that about 80% of the theoretically available information was being extracted from each interview recording. This was being accomplished with, on the average, 2.6 hours of each judge's time and 1.8 hours of each blocker's time for every 40-50 minute segment of a recorded interview. Therefore, information loss (approximately 20%) did occur and the richness of the origino. interview wos not completely reflected in the final list of content units. An important issue is the significance of the information lost. Increasing the percent of information extracted to, 90% could be achieved in at least two ways: 1) increase the number of judges and/or blockers, 2) intensify the training of judges and/or blockers. Both of these actions would increase the gain of information by 10%. The present researchers considered such on increase to be of lower priority than the allocation of available resources to other important activities, such as selecting interviewees. It should also be noted that the information obtained by the judging-blocking procedures was in a very manipulable form; this allowed the design of economical and efficient sorting procedures.

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[1] Assuming judges to be independent, one can use the percent of overlap among the items they draw from an interview to estimate the total number of potential items in the recording.

If N represents the total number of potential items, P_1 the proportion of ideas recorded by J_1, P_2 the proportion of ideas recorded by J_2, and $P_1 P_2$ the proportion of overlapping ideas, or those common to both judges, then it can be shown that

$N P_1 P_2$ = number of common statements, $P_1 P_2$

$N P_1$ = number of J_1 statements, i_1

$N P_2$ = number of J_2 statements, i_2 and

$N (i_1/N)(i_2/N) = P_1 P_2$.

For the data discussed in the text above,

$$N = \frac{(73)(59)}{37} = 117.$$

d. RELATIONSHIPS BETWEEN CONTENT UNIT PRODUCTIVITY AND OTHER SELECTED VARIABLES

The summarization of the first hour of each of the 32 interview recordings yielded 2302 content units. These units operationally defined a sample of the elements of the content domain which was further investigated by the sorting procedures and Latent Partition Analysis. To understand some of the factors which might be associated with the production of these 2302 units, two analyses were performed in which the number of content units for each interview recording was defined as a major variable. Relationships between this variable and other selected variables could be observed. The two analyses used were principal components analysis and analysis of variance.

Principal Components Analysis

To investigate the interrelationships among factors which might influence the content summarization process, twenty variables were assembled which characterized the 15 interview recordings discussed earlier. The twenty variables included 10 characteristics of the interview, 3 variables related to content summarization, and 7 variables describing professional characteristics of the interviewees. A listing of the variables and their means and standard deviations, is given in Table 10.7.

Intercorrelations were calculated among the twenty variables and are given in Table 10.8. These coefficients were the input for a principal components analysis which was performed purely for exploratory purposes. Reliable and valid information could be obtained only by analyzing 100 or more sets of such variables. Due to the high cost of gathering such data, this could not be done.

Five relatively clear factors were identified. The unrotated principal components factor matrix is given in Table 10.9, and a summary description of the five components appears in Table 10.10. These results suggest that each of the three interview participants performed quite distinct roles. The first factor, which accounts for the greatest proportion of the variance, focuses on the performance of the leading interviewer and indicates that his responses were positively related to the number of times the interviewee talked and negatively related to the percent of time the teacher talked. This is consistent with that interviewer's intention to increase the frequency of his questions and comments when an interviewee was not responsive and to decrease his discussion when an interviewee was very responsive.

The second factor, Interviewee Teaching Experience, indicates high positive relations among the interviewee's years of local and total experience and annual salary--an anticipated circumstance. The

TABLE 10.7

MEANS AND STANDARD DEVIATIONS OF VARIABLES CHARACTERIZING INTERVIEWS, CONTENT SUMMARIZATIONS, AND INTERVIEWEES
N = 16

	Mean	S. D.
1. Total interview talking time	3106.06	526.92
2. Time talked by interviewee (T)	2660.75	563.38
3. Percent of time talked by T	85.11	5.31
4. Number of times T talked	77.06	19.82
5. Time talked by Leading Interviewer (I_A)	351.50	114.17
6. Percent time talked by I_A	11.76	4.44
7. Number of times I_A talked	54.62	17.24
8. Time talked by Supporting Interviewer (I_B)	93.61	40.69
9. Percent time talked by I_B	3.13	1.47
10. Number of times I_B talked	24.25	10.28
11. Number of Content Units	75.98	21.79
12. Number of statements prepared by first judge	83.81	22.79
13. Number of statements prepared by second judge	67.38	14.01
14. Highest teaching credential of T	6.69	3.08
15. Highest academic degree of T	3.50	.71
16. Annual salary of T	4812.50	499.43
17. Years of local experience of T	6.75	4.39
18. Years of total teaching experience of T	14.16	8.92
19. Grade spread	2.25	1.68
20. Average grade of students taught by T	4.50	1.85

TABLE 10.8

INTERCORRELATIONS OF INTERVIEW, CONTENT SUMMARIZATION, AND TEACHER CHARACTERISTIC VARIABLES

$N = 16$

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1.		97	62	-40	-13	-58	-49	-14	-49	08	-28	12	09	19	-01	11	-06	18	53	16
2.			79	-56	-35	-75	-65	-27	-59	-02	-37	05	00	26	13	13	-13	12	50	08
3.				-88	-83	-97	-88	-52	-68	-27	-47	-11	-23	39	44	15	-29	-09	27	-14
4.					79	83	86	61	66	54	57	21	47	-37	-42	-13	27	19	-05	17
5.						88	84	33	32	19	39	22	33	-26	-40	-06	36	19	-10	30
6.							93	32	48	09	44	09	24	-30	-30	-11	34	08	-32	18
7.								23	36	04	40	-04	47	-32	-19	-13	29	06	-26	12
8.									90	85	37	22	17	-48	-77	-25	01	13	20	04
9.										70	38	12	10	-50	-68	-22	04	06	-03	-04
10.											41	44	17	-26	-58	-10	04	26	39	14
11.												68	49	25	-02	19	35	21	-17	24
12.													01	35	-01	27	15	08	15	26
13.														-05	-01	15	25	37	11	17
14.															65	41	16	04	-13	46
15.																25	08	04	-21	00
16.																	60	43	-16	-10
17.																		72	03	10
18.																			30	11
19.																				16
20.																				

TABLE 10.9

FACTOR MATRIX OF FIVE MAJOR PRINCIPAL COMPONENTS
(Rotated)

Variables	Factors					
	1	2	3	4	5	h^2
1	-22	06	-10	05	91	89
2	-40	04	-20	02	86	93
3	-78	-03	-38	-04	47	97
4	78	11	49	14	-22	92
5	90	08	17	09	-03	86
6	86	04	17	03	-45	96
7	92	05	07	-07	-33	96
8	19	-02	95	10	-03	95
9	22	-02	87	04	-37	94
10	04	09	87	32	19	91
11	33	28	24	72	-27	84
12	-02	13	22	84	03	77
13	52	35	04	10	23	46
14	-23	13	-58	69	06	88
15	-22	15	-80	19	-11	76
16	-20	79	-22	20	-10	77
17	29	85	-05	08	-05	82
18	16	82	12	-00	27	79
19	-07	06	32	-02	75	67
20	40	-18	-13	58	34	66
SS	470	236	418	227	321	

third factor, Supporting Interviewer/Interviewee Interaction, suggests that responses of I_B were particularly frequent when the interviewee held a relatively low academic degree. It should be noted that I_B did not know the characteristics of a teacher prior to an interview. The fourth factor, Content Unit Production, suggests that the number of statements summarized by the number of content units derived by blockers were higher for interviewees with high credentials for teaching. The fifth factor, Interview Length, indicates that the total time of interview and interviewee talk were increased when the teacher interviewed had a class of students spanning a wide number of grades.

Though the components and derived factors are extremely tenuous and only superficially descriptive, the results seem to reflect that the interview was not structured or carried out to favor certain kinds of teachers. As intended, the interview process was conditioned by the verbal interaction during the interview, and this interaction was a differential function of the roles of persons in the interview setting.

TABLE 10.10

SUMMARY DESCRIPTIONS OF FIVE MAJOR PRINCIPAL COMPONENTS

Factor		Variable	Loading
1. I_A/T Interaction	7.	Number of times I_A talked	92
	5.	Total time I_A talked	90
	6.	Percent of time I_A talked	86
	4.	Number of times T talked	78
	3.	Percent of time T talked	-78
2. T Teaching Experience	17.	T's local teaching experience	85
	18.	T's total teaching experience	82
	16.	T's annual salary	79
3. I_B/T Interaction	8.	Total time I_B talked	95
	9.	Percent of time I_B talked	87
	10.	Number of times I_B talked	87
	15.	T's highest degree	-80
4. Content Unit Production	12.	Number of statements by first judge	84
	11.	Number of content units produced	72
	14.	T's highest teaching credential	69
5. Interview Length	1.	Total talk time in interview	91
	2.	Total time T talked	86
	19.	T's span of grades taught	75

Analysis of Variance of Content Unit Yield

The 32 interviewees were selected and the interviews conducted according to an experimental design. This design, as described in Chapter 5.c, included six district variables, three teacher variables, and three interview schedule variables. The purpose in using this fractional factorial design was to provide an unbiased, balanced approach to the conduct of the interview study. The design also provided a framework for evaluating the relationship between the number of content units derived from an interview recording and the factors used in the design. By segmenting and rearranging the factors in the total design, three complete factorial analyses were constructed and performed to evaluate the relationships between the corresponding independent variables and the dependent variable, number of content units. There were three analyses of variance: 1) district characteristics, 2) teacher characteristics, and 3) interview planning factors.

District characteristics. Four of the six district factors were used to define a 2^4 factorial design. The factors were Numerical Size , Organizational Complexity, Teacher Experience, and School Unit Size. The summary analysis of variance is presented in Table 10.11, and indicates that none of the factors were statistically significantly related to the number of content units extracted from interview recordings.

TABLE 10.11

ANOVA OF NUMBER OF CONTENT UNITS AS A FUNCTION OF FOUR DISTRICT CHARACTERISTICS

Source	df	Sum of Squares	Mean Square	F
Numerical Size (S)	1	512.000	512.000	1.09
Organizational Complexity (C)	1	120.125	120.125	<1
Teacher Experience (T)	1	666.125	666.125	1.42
School Unit Size (U)	1	6.125	6.125	<1
S x C	1	4.500	4.500	<1
S x T	1	.500	.500	<1
S x U	1	512.000	512.000	1.09
C x T	1	1.125	1.125	<1
C x U	1	3.125	3.125	<1
T x U	1	15.125	15.125	<1
S x C x T	1	264.500	264.500	<1
S x C x U	1	32.000	32.000	<1
S x T x U	1	60.500	60.500	<1
C x T x U	1	105.125	105.125	<1
S x C x T x U	1	18.000	18.000	<1
E (S x C x T x U)	16	7527.000	470.438	
Total	31	9847.875		

Teacher characteristics. Each of the second sub-set of variables in the sampling plan was a teacher characteristic and had two levels: high or low on Local Teaching Experience, high or low on Highest Teaching Credential, and high or low on Annual Salary. These three variables defined a 2^3 factorial design for analyzing the variance among the number of content units. The summary analysis of variance is given in Table 10.12. No significant effects of teacher characteristics were observed.

TABLE 10.12

ANOVA OF NUMBER OF CONTENT UNITS AS A FUNCTION OF THREE TEACHER CHARACTERISTICS

Source	df	Sum of Squares	Mean Square	F
Local Experience (L)	1	8.000	8.000	< 1
Highest Credential (H)	1	392.000	392.000	1.11
Annual Salary (A)	1	630.125	630.125	1.79
L x H	1	190.125	190.125	< 1
L x A	1	162.000	162.000	< 1
H x A	1	.500	.500	< 1
L x H x A	1	6.125	6.125	< 1
E (L x H x A)	24	8459.000	352.458	
Total	31	9347.875		

Interview schedule. During the early interview trials it had been necessary to divide the long list of discussion topics into 4 groups. Each of the 4 groups of topics (see Appendix E) defined one hour of an interview, so no interviewee ever responded to more than two parts of the interview schedule. The sampling design for the final interview study designated each of the 4 groups of topics to be administered to 8 interviewees; the order of the interviews was also controlled. Hence a one-way analysis of variance, with four levels, could be applied to the content unit variable. The summary analysis is given in Table 10.13. It indicates that the number of content units did not differ significantly among the four one-hour schedules.

TABLE 10.13

ANOVA OF NUMBER OF CONTENT UNITS AS A FUNCTION OF INTERVIEW SCHEDULES

Source	df	Sum of Squares	Mean Square	F
Schedule (S)	3	1412.375	470.792	1.56
Error	28	8435.500	301.268	
Total	31	9847.875		

In summary, none of these eight independent variables was found to be statistically related to the number of content units produced from the interview recordings. That is, the 32 interviewed teachers were homogeneous with respect to the quantity of descriptions of classroom behaviors and events which they proferred during their interviews, though qualitative characteristics may well have varied.

CHAPTER 11

SORTING EXPERIMENTS

The sorting task described in Chapter 6 was used to gather data relevant to the substance and structure of teachers' views. Instructions for the sorting task directed teachers to discriminate the similarities and dissimilarities among a set of content units and to construct a manifest partition to represent their perceptions of the behaviors and events described in the content units. Following the development of the sorting procedures, two experimental studies were conducted to determine the effect of certain task variables on, particularly, the number and size of categories. The results of these studies, Sorting Experiments 1 and 2, were used to design the major study, Sorting Experiment 3. In this chapter the plan of each of the three sorting experiments will be described, and results will be presented concerning the sorting behaviors of the participating teachers. The results of Sorting Experiment 3, which were obtained by applying Latent Partition Analysis to the teachers' manifest partitions will be given and discussed in Chapter 12.

a. SORTING EXPERIMENT 1

During the initial administrations of the sorting procedures, several procedural questions were raised about the effects of certain factors on the manner in which teachers constructed their categories. Six important questions were:

1. If a set of content units to be sorted is composed of units drawn from several interviews, will the formation of manifest categories be related to the number of interviews contributing units?
2. Will the particular interviews which contribute content units have different effects on the construction of manifest categories?
3. What variations occur in manifest categorizations which are associated with individual differences among sorters?
4. As the number of content units sorted increases, is there a corresponding increase in the number of manifest categories formed?
5. If sorters are directed to re-sort their categories at different stages of the sorting process, will there be corresponding differential numbers of categories?
6. Will practice in the sorting process increase or decrease the number of manifest categories constructed by sorters?

Answers to these questions were important guidelines for designing sorting tasks to be conducted later in the project. Therefore, the questions were used as bases for defining six factors, or independent variables, which could be experimentally investigated. This was possible early in the project, during Phase B (see Foldout A) since eight interviews had been conducted and analyzed, and a total of 1150 units were available.[1] The purpose of Sorting Experiment 1 was to evaluate the effects of these six factors on the number of manifest categories constructed by sorters.

Design of Sorting Experiment 1

In Sorting Experiment 1, 16 teachers sorted several sets of 144 content units which were arranged in different ways. The design of the experiment is given in Table II.1. There were five independent variables, each of which had several levels:

Factor A, Number of Interviews: This factor consisted of four levels defined by whether one, two, four, or six interview summaries contributed content units to the pool of 144 units.

Factor B, Particular Interviews: This factor consisted of two levels, nested within Factor A; each level specified which one or combination of the eight interview summaries contributed content units.

Factor C, Individual Sorters: This factor consisted of 16 levels which corresponded to the 16 participating sorters.

Factor D, Number of Content Units. This factor consisted of 7 levels defined by the cumulative number of content units sorted at each of seven stages in sorting. The stages were the completion of sorting 24, 36, 48, 72, 96, 120, and 144 content units.

Factor E, Stage of Re-sorting: This factor consisted of four levels specified by the stage at which a teacher re-sorted his manifest categories. The four levels corresponded to re-sorting after having sorted 24, 36, 48, or 72 content units.

Factor F, Practice: This factor was investigated by conducting the basic experiment twice in one day. In the morning each of the 16 teachers was randomly assigned to levels of treatment of Factors A, B, and E, and to a randomly ordered set of 144 content units. In the afternoon each teacher was assigned to the same levels of Factors A, B, and E, but received a different randomly ordered set of content units.

[1] The eight interviews had the following corresponding numbers of content units: 1) 98 units, 2) 107 units, 3) 142 units, 4) 139 units, 5) 158 units, 6) 193 units, 7) 140 units, and 8) 173 units.

TABLE 11.1

DESIGN MATRIX FOR SORTING EXPERIMENT 1

Factor A Number of Interviews	Factor B Particular Interviews	Factor C Individual Sorters	Factor D Number of Content Units (Cumulative)						
			24	36	48	72	96	120	144
1 Interview	1 a	1		R_2					
	1 a	2			R_3				
	1 b	3	R_1						
	1 b	4				R_4			
2 Interviews	2 a	5				R_4			
	2 a	6	R_1						
	2 b	7		R_2					
	2 b	8			R_3				
4 Interviews	4 a	9	R_1						
	4 a	10				R_4			
	4 b	11			R_3				
	4 b	12		R_2					
6 Interviews	6 a	13			R_3				
	6 a	14		R_2					
	6 b	15				R_4			
	6 b	16	R_1						

Note: Factor E, Stage of Re-sorting, had four levels which are indicated here as R_1, R_2, R_3, and R_4. This code designates the stage at which each sorter re-sorted his manifest categories.

Factor F, Practice, had two levels; the design shown here was repeated in the afternoon, after an initial administration in the morning.

The dependent variable used in evaluating the effects of the above factors was the final number of manifest categories a sorter constructed from a set of 144 content units. All teachers were given the same instructions and training prior to the beginning of the morning experiment. Also, as directed by the standard sorting procedures (see Appendix F), all teachers re-sorted after sorting all 144 content units in both the morning and afternoon experiments. The specific manner in which the levels of Factors A through E were operationalized is discussed in the following paragraphs.

The four levels of Factor A, Number of Interviews, were defined in the following manner:

Number of Contributing Interviews	Components of Content Unit Sets
One interview	144 content units drawn from a single interview
Two interviews	72 content units drawn from each of two interviews
Four interviews	36 content units drawn from each of four interviews
Six interviews	24 content units drawn from each of six interviews

The particular selection of interview summaries which were used to form sets of content units was specified by the levels of Factor B.

Two levels of Factor B, Particular Interviews, were nested under each level of Factor A. Therefore, eight differently composed sets of content units were defined. The specifications of these eight sets are given in Table 11.2.

TABLE 11.2

SPECIFICATIONS OF EIGHT SETS OF CONTENT UNITS

Factor A: Number of Interviews	Level	Factor B: Particular Interviews Content Unit Set
1	1 a	144 units from Interview 3
	1 b	144 units from Interview 6
2	2 a	72 units from each of Interviews 4 & 5
	2 b	72 units from each of Interviews 2 & 7
4	4 a	36 units from each of Interviews 1, 4, 7 & 8
	4 b	36 units from each of Interviews 2, 3, 5 & 6
6	6 a	24 units from each of Interviews 1, 3, 4, 5, 6, & 8
	6 b	24 units from each of Interviews 1, 3, 4, 6, 7, & 8

The selection of the particular interviews from which the specified number of content units were drawn was made randomly from the available eight interview summarizations. In the case of Levels 1 a, and 1 b, the selection had to be made from summarizations which listed at least 144 content units; there were only three such interviews. For each of the eight levels of Factor B, the selection of the specified number of content units was made randomly from the particular interviews designated. After each set of content units had been assembled, the units were randomly ordered and grouped in packets in numbers specified by the seven levels of Factor D, Number of Content Units.

The 16 levels of Factor C, Individual Sorters, corresponded to the 16 participating teachers. Two teachers were assigned at random to each of the eight sets of 144 content units specified by the levels of Factor B. The conditions for each sorter were further specialized by assignment to one of the four levels of Factor E, Stage of Resorting.

The seven levels of Factor D, Number of Content Units, were defined by the cumulative number of units a teacher had categorized at seven points in the sorting process. These levels were completion of sorting of 24, 36, 48, 72, 96, 120, and 144 content units. Operationally, these levels meant grouping the units into 7 packets which, in the sequence of presentation, consisted of 24, 12, 12, 24, 24, 24, and 24 units. After sorting each packet, a sorter recorded the cumulative number of manifest categories he had constructed. These records provided the data for evaluating the effects of the independent variables.

The four levels of Factor E, Stage of Re-sorting, specified whether a teacher re-sorted after categorizing 24, 36, 48, or 72 content units. To systematically balance the assignment of re-sorting stages within the dimensions of the design determined by Factors A, B, C, and D, a fractional factorial design was superimposed on the eight treatment groups nested within each level of Factor A. The patterns of assignments defining the four levels of Factor E are given in Table 11.1.

Results of Sorting Experiment 1

There were three analyses of the data matrix resulting from the records of the 16 teachers: a) analysis of variance of the number of final categories in terms of four independent variables, b) cumulative number of categories formed as a function of the cumulative number of content units sorted, and c) number of final categories as a function of stage of re-sort.

ANOVA of final number of categories. A 4 x 2 x 8 x 16 repeated-measures nested factorial design was defined by four factors: Number of Interviews (Factor A), Practice (Factor E), Particular Interviews (Factor B), and Individual Sorters (Factor C). The summary table for the resulting ANOVA is given in Table 11.3. The only statistically significant result was the difference between the number of final categories formed in the morning and the number formed in the afternoon. In the morning the mean number of categories was 28.4, and in the afternoon the mean was 25.1. It seemed, from informal observations and discussions with the sorters, that this decrease was probably due to tiredness and strain which reduced the teachers' concentration and their ability to discriminate similarities and dissimilarities among the content units in the afternoon. This conclusion suggested to the researchers that, in later sorting studies, teachers should not be asked to sort for more than one four-hour period in one day. The lack of significant differences associated with the other factors indicated that the manner in which a set of content units was composed would not influence the number of categories constructed. It was also observed that there was a correlation of .76 between the number of categories constructed in the morning and the number constructed in the afternoon.

Cumulative number of categories. The seven stages of the sorting sequence were defined as selected values of the cumulative number of content units a teacher had sorted The stages were identified as the completion of sorting 24, 36, 48, 72, 96, 120, and 144 content units. For each of the two administrations of the experiment, the mean number of categories formed by teachers was calculated for each of the seven stages. The results are graphically presented in Figure 11.1. As shown there, as the number of content units increases, fewer new manifest categories are added. It should also be noted that a proportionally larger number of categories was constructed from the first 24 content units (the order of all sets of units was randomized) than during any other stage of the sorting process.

Stage of re-sorting. The four levels of Factor E specified whether teachers re-sorted after 24, 36, 48, or 72 content units. For each administration of the experiment, the final numbers of categories were tabulated for teachers who re-sorted at each of these four stages. The mean numbers of final categories are graphed in Figure 11.2. This figure suggests that re-sorting after 24, 36, or 48 units was not as efficient as re-sorting after 72 units. An analysis of variance was also performed on this data, but no statistically significant results were observed.

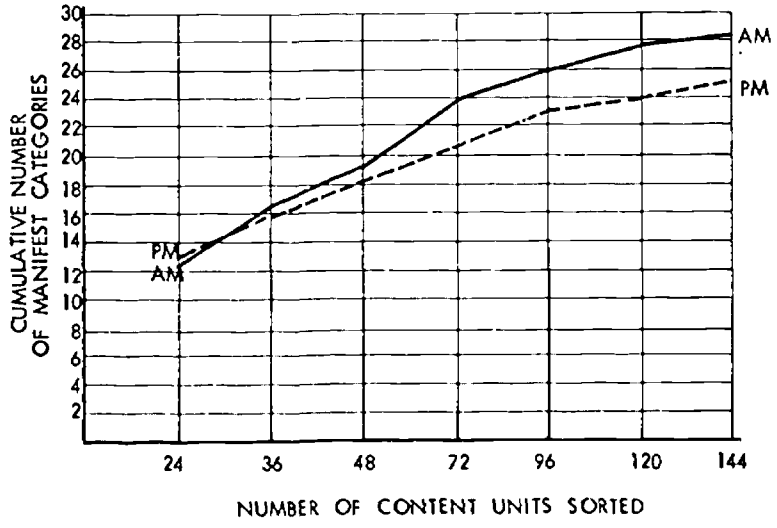

Figure 11.1 Relationship between cumulative number of manifest categories and number of content units sorted.

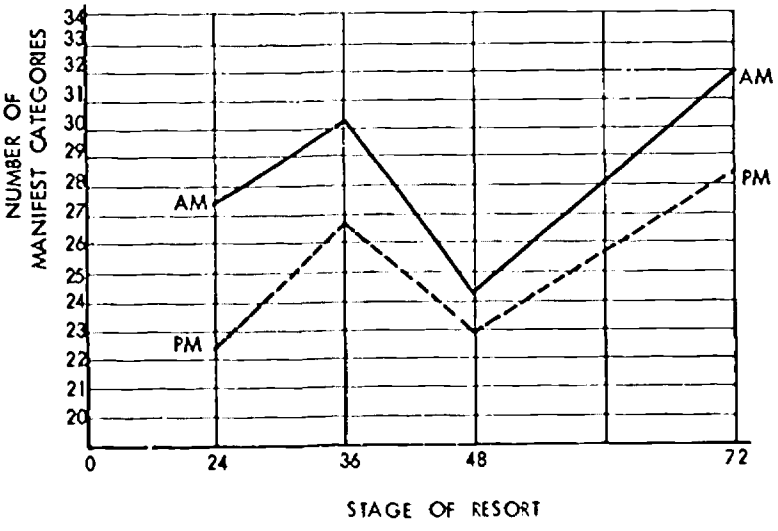

Figure 11.2 Relationship between number of manifest categories and stage of re-sort.

TABLE 11.3

ANOVA SUMMARY FOR SORTING EXPERIMENT 1

Source	df	Sum of Squares	Mean Square	F
Number of Interviews (A)	3	82	27	1
Time of Day (T)	1	91	91	8.6[a]
Individual Sorters (P)	8	640	80	
Sorter Pairs (S/A)	4	300	75	1
A x T	3	28	9	1
T x P	8	57	7	
S/A x T	4	70	18	2.6

[a] $p < .025$. The error term for testing the Time of Day effect was obtained by pooling the sums of squares and the degree of freedom for the S/A x T and T x P effects, after the S/A x T effect was tested and found not significant.

Conclusions. The information obtained from Sorting Experiment 1 was used as a basis for designing later sorting experiments. As noted elsewhere, an important consideration in designing the sorting task was to establish conditions under which teachers could efficiently and effectively make fine discriminations among content units. The results presented above suggested that a) the performance of sorters was impaired by long periods of sorting in one day, b) after 120 content units had been sorted the number of categories did not increase appreciably, and c) re-sorting before completing categorization of 72 content units was inefficient in terms of the number of final categories constructed. It also suggested that pooling content units derived from several interview recordings did not influence the number of final categories constructed.

b. SORTING EXPERIMENT 2

It was observed in Sorting Experiment 1 that,generally, few new categories were constructed by sorters after they had categorized as many os 120 content units. The sets of 144 units used in that experiment were randomly drawn, without replacement, from o total pool of 1150 units. These sets were small samples of the available content pool and may have been biased or otherwise inadequate representations of the total domain of ideas.

It was also observed during Experiment 1 that the physical demands of the sorting task limited the number of content units a teacher could sort in one day. Consequently, it was decided to estimate the maximum number of content units teachers could process under conditions which allowed them to distribute the work of sorting over a period of several days.

Administration

The purpose of Sorting Experiment 2 was to administer a task which required the categorization of a large number of content units under conditions which reduced the effects of fatigue. To accomplish this, 600 content units were randomly drawn, without replacement, from the same pool of 1150 units which was used in the first experiment. Eight teachers (qualified substitute teachers recommended by a local school district) were hired to work at sorting on several successive mornings. During the first morning, the teachers were given a two-hour training session. After training, they began sorting the 600 content units.

The arrangements and administration of the sorting task were the same as the standard procedures described in Chapter 6 and Appendix F. Each of the eight teachers sorted the same set of 600 content units, but each set was randomized so no two teachers encountered the units in the same order. The content units were assembled in packets of 20, and after all the units in a packet were sorted, each teacher recorded the time it took him to sort the packet and the number of total categories he had constructed up to that point. These records provided the data for determining the outcomes of the experiment.

To estimate a parametric value of a continuous variable, a 10% sample would be adequate if certain assumptions about the population were valid. The precision of such estimates depends on characteristics of the sampling distribution of the statistic. However, no method is known to exist which allows estimation of sampling distributions for non-quantified data, so there was no way to know how large a sample of content units would have to be to provide a reasonably precise qualitative estimate of the substance and structure of teachers' views. In the absence of such information, the conservative approach would be to assemble the largest possible sets of content units to be sorted; this would maximize the probability of generating representative, unbiased, estimates of the substance and structure of teachers' views.

Each teacher was asked to re-sort his manifest categories at the end of each morning; each teacher reviewed his categories at the beginning of the following morning. They were instructed to do this so a minimum of actual sorting time was spent in re-establishing the salience of the task.

Results

The summary statistics characterizing the performance of the eight sorters are given in Table 11.4. On the average, teachers spent 18.3 hours performing the sorting task. This average working time consisted of 9.76 hours to initially process the 600 content units and 8.53 hours of re-sorting time. This division of time is also reflected in the average time of processing 20-unit packets, which was .61 hours. Of this time, .33 hours were spent in initially sorting the units into categories. The average number of categories per packet was 4.84. The mean number of final categories constructed was about 145, which indicates that a typical category was composed of four or five content units.

Intercorrelations of the 7 variables were calculated and are given in Table 11.5. Though these coefficients are based on only eight persons and are therefore very tenuous, they suggest that the operations of sorting and re-sorting are independent; total re-sort time correlates with total sorting time .15 and with average sorting time per packet .36. The total number of categories does not appear to be related to the time taken for sorting or re-sorting the content units.

Graphs were prepared to illustrate the relationships, for each sorter, between packets of 20 content units and a) cumulative sorting time, and b) cumulative number of categories constructed. The means and ranges of these characteristics are plotted in Figure 11.3 and Figure 11.4. Figure 11.3 indicates that the time taken to sort (but not re-sort) packets of content units is relatively constant. Figure 11.4 demon-

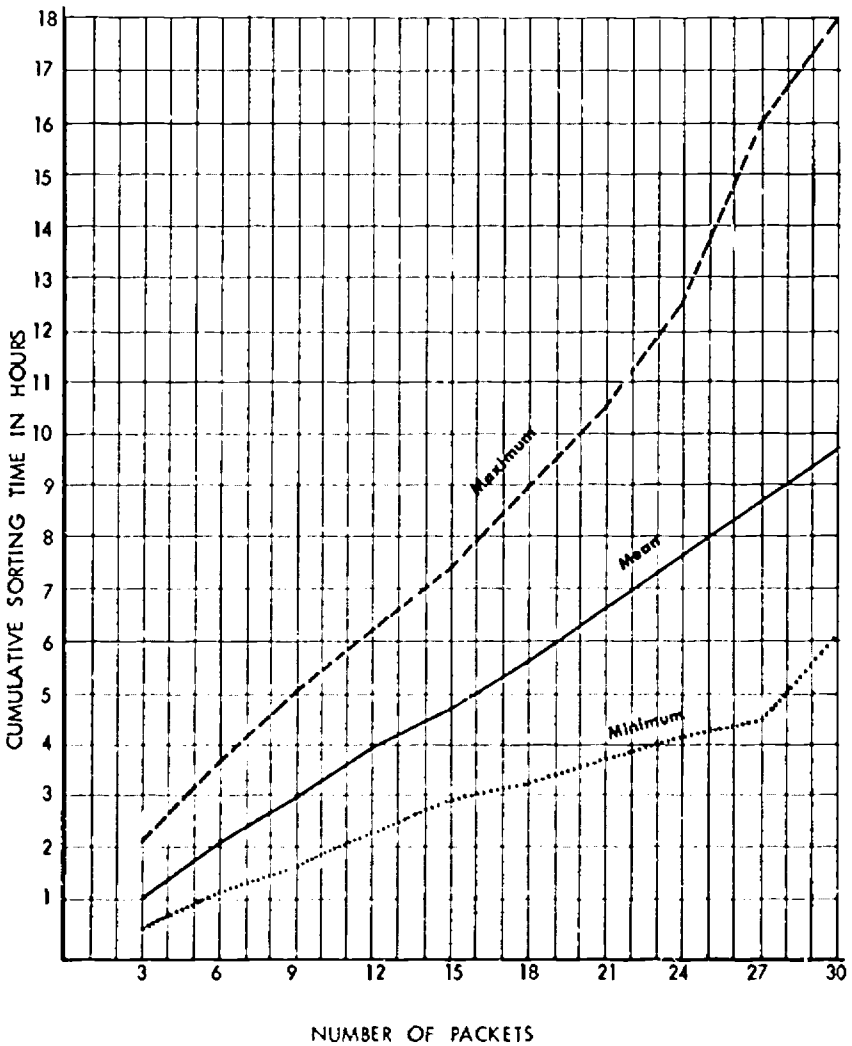

Figure 11.3 Cumulative sorting time as a function of the number of items sorted (20 items per packet).

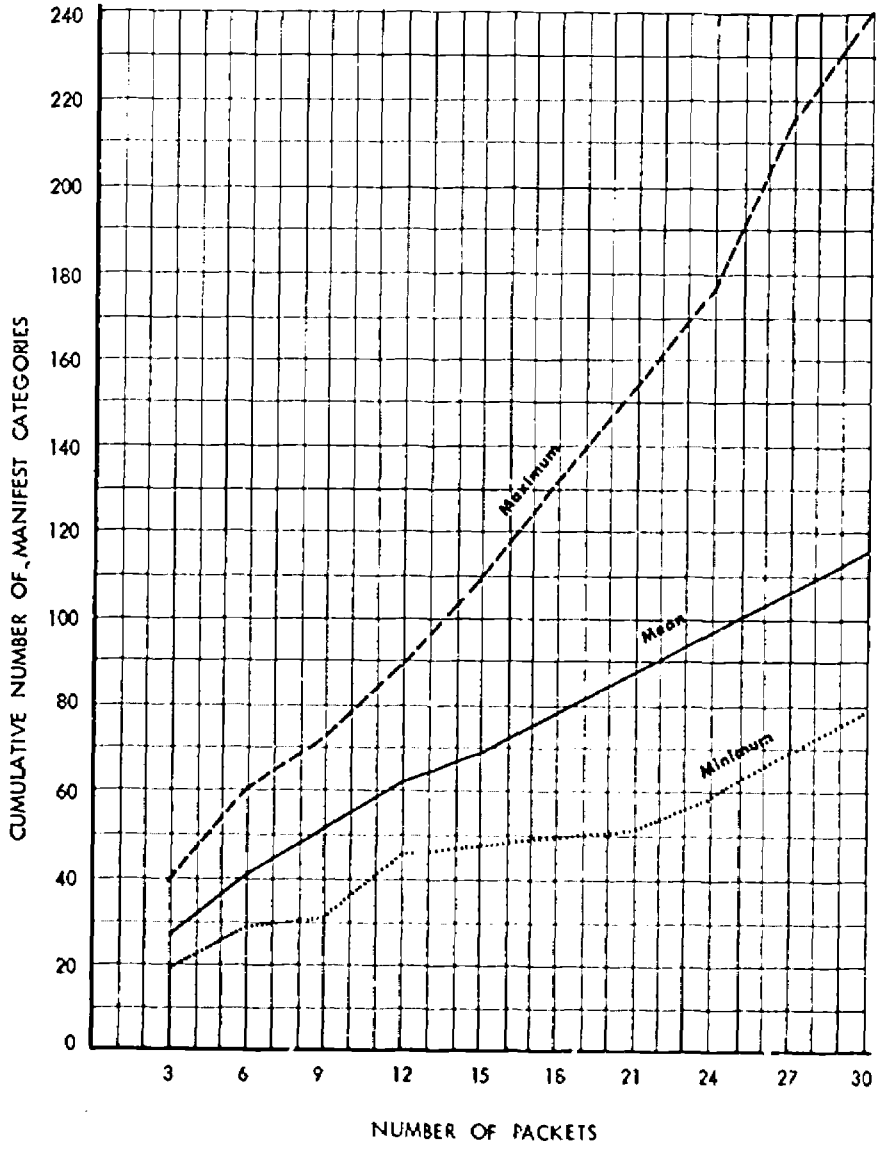

Figure 11.4 Cumulative number of manifest categories as a function of the number of items sorted (20 items per packet)

TABLE 11.4

SUMMARY STATISTICS FOR SORTING EXPERIMENT 2
N = 8

Sorter No.	Variable 1 Final Total Time[a]	Variable 2 Final Sorting Time[a]	Variable 3 Final Resorting Time[a]	Variable 4 Average Sorting Time/pkt.[b]	Variable 5 Average Total Time/Pkt.[b]	Variable 6 Average No. of Categories/Pkt[b]	Variable 7 Total Number of Categories
1	15.97	9.80	6.17	.33	.55	4.16	125
2	20.68	6.00	14.68	.20	.68	4.63	139
3	14.15	8.05	6.10	.27	.47	4.60	138
4	11.77	5.00	6.77	.17	.40	3.23	97
5	24.50	14.17	10.33	.47	.82	3.80	114
6	12.72	6.42	6.30	.22	.42	5.26	158
7	27.43	7.87	9.57	.60	.92	8.13	244
8	19.17	10.80	8.37	.37	.63	4.90	147
Mean	18.30	9.76	8.53	.33	.61	4.84	145.25
Standard Deviation	5.29	4.15	2.80	.14	.20	2.00	41.42

[a] measured in hours

[b] Each packet contained 20 content units

TABLE 11.5

INTERCORRELATIONS OF EIGHT VARIABLES FOR SORTING EXPERIMENT 2
N = 8

Title of Variable	Variable						
	1	2	3	4	5	6	7
1. Total Sorting Time	1.00	.15	.87	.97	.78	.51	.33
2. Total Re-sorting Time		1.00	.64	.36	.57	.15	.07
3. Final Total Time			1.00	.81	.67	.58	.28
4. Average Sorting Time/Packet				1.00	.67	.62	.31
5. Average Total Time/Packet					1.00	.53	.27
6. Total Number Categories						1.00	.49
7. Average Number Categories/Packet							1.00

states a very similar function for the increase in total number of categories over successive packets of content units.

The general conclusion drawn from these observations was that, under favorable conditions, teachers can effectively sort a large number of content units. This was further supported in informal discussions with the teachers, who commented that although the task was intellectually demanding and physically exhausting, it was meaningful even on the last day of work.

The manifest categorizations of the eight teachers were investigated by Latent Partition Analysis, which at that time was in an early stage of development.[1] Several exploratory analyses were made to test the validity of LPA as a technique for identifying the structure of manifest partitions. The analyses were complicated by limitations in the storage capacity of the computer (a CDC 1604); not all 600 content units could be analyzed simultaneously and, therefore, sub-sets of content units had to be sampled from the sorted set of 600 units. Sub-sets of 100 content units were sampled, and resulting analyses provided evidence for the validity of the LPA technique.

These first results from LPA seemed very interpretable, and this interpretability was taken as strong evidence for the validity of the technique. To ensure that apparent interpretability was not an artifact of the computational procedures; one further analysis was conducted. Sub-sets of content units were randomly selected, and several random sets of manifest categories were formed. These randomly constructed manifest partitions were then analyzed with LPA, and no interpretable structure could be identified. It was concluded that interpretability of LPA results was a function of teachers' perceptual commonalities, and not of any methodological artifact.

The substantive aspects of the latent categories were also examined in detail. Particular attention was given to identifying any characteristics of the substance of content units which might have influenced sorters' categories. Three compositional characteristics of the content unit description carefully examined were a) ambiguity, b) length, and c) idioms and catch words.[2] Ambiguity was apparent in

[1] Joan F. Baker, An Emprical Study of a Procedure for Categorizing Statements which Concern the Facilitation of Learning in the Classroom, 1965.

[2] Ibid, 1965.

several descriptions which referred to two or more classroom behaviors or events. For example, one content unit was:

> "This teacher, when she had seen that the children were not able to pick the mammals from a longer list of animals, decided that it was necessary to again have the class work as a whole and clear up this misunderstanding. She then retested and found much better results.

Such units appeared to suggest a variety of categorizations. In this example the matter of retesting is peripheral to the teaching practice given in the first sentence. The main implication of these compositional studies was that judging and blocking interview recordings should be made more precise.

It was desired that the length of statements should not affect sorters' ability to categorize clearly. A tabulation was made of content units which seemed to be clearly categorized and those which appeared to cause difficulties. No differences were found between the lengths of these two kinds of units and, in fact, the more clearly categorized units were, on the average, longer than the confusing units. A scan of the substantive characteristics of the latent categories suggested that certain verbal aspects of the descriptions of content units might be cuing the sorters as to kinds of categories they might construct. For example, such words as "low," "slow," "top," "tent," "spelling," "rule," "discipline," may have directed a sorter's attention to particular ways of perceiving the described behavior or event. A study of the units indicated that the sorters had not used such words as major cues or "crutches" to avoid thinking about a statement. Major evidence for this was the frequency with which content units characterized by such words were sorted into categories not related to obvious referents. Additional evidence that teachers did not use single words as crutches was the fact that content units in certain categories had no word or words in common.

It was concluded from these investigations that there was justification for the assumption that sorters had understood and followed the instructions for categorization and that the substance of latent categories could therefore be valid if interpreted as revealing sorters' perceptions of classroom-relevant behaviors and events. It was clear that the teachers had read and thought about the content unit descriptions before categorizing them. More detailed and systematic study of such factors had to be delayed until the major components of categorization methodology were more firmly established.

c. SORTING EXPERIMENT 3

In Phase C (see the Research Triptych), several major developments of the research had been completed, and it was possible to undertake a major investigation of the substance and structure of teachers' views. In this investigation, the sorting procedures would be the data-gathering method and LPA would be the mode of analysis. The major research components which were implemented in Phase C were the stratified sampling procedure for selecting teachers (Chapter 5), the consequent major interview study (Chapter 6) improved procedures for content summarization (judging and blocking), sorting procedures, and the refined formulation of Latent Partition Analysis.

Administration

A plan was developed for the major sorting study, Sorting Experiment 3. The sorting task used in this study employed the final set of sorting instructions and 128 content units. This number of units was selected for two reasons. The first of these reasons was that, in light of experience gained during early developments of categorization methodology, it was considered appropriate to involve a heterogeneous sample of teachers in sorting so baseline data would be obtained which could provide perspective in future studies. To achieve this heterogeneity, the sample of teachers for sorting was drawn according to the same algorithm used for selecting teachers to be interviewed. Due to limitations of resources, the only arrangements which could be made were for teachers to perform the sorting task during morning or afternoon school hours. Information obtained from Sorting Experiments 1 and 2 indicated that teachers could efficiently and effectively categorize 120-140 units within a three-hour period; with the additional time required for instructions and training, a maximum four-hour work load was therefore defined by 128 units.

The second reason for choosing 128 units was related to the method by which units were sampled from interview summarizations. After summarization of the recordings from the major interview study, there were 2302 content units which represented the substance of interviews with 32 teachers. Four content units were drawn randomly, without replacement, from each of the 32 summarizations; thus a set of 128 units was generated which could be categorized by teachers within the time limitations.

A sample of teachers was drawn for the major sorting experiment according to the stratified sampling procedures described in Chapter 5, and materials for the sorting task were finalized. The participating teachers in Sorting Experiment 3 worked under standardized conditions. Each set of 128 content units, was of course, individually randomized.

This study was also used as an opportunity to investigate consistency of sorting. To do this, one duplicate content unit was added to each set of 128 content units prior to randomization.

The final paragraphs of this chapter will describe the performance aspects of the teachers in Sorting Experiment 3; description of the substantive aspects of the analysis of the manifest categorizations is in Chapter 12.

Observations of Sorting Behaviors

Summary statistics characterizing the sorting behaviors of the teachers are given in Table 11.6. As shown there, the total average time taken to perform the task was about two hours, and the mean number of categories formed from the 128 units was 36.45. The teachers were quite variable in the amount of time, ranging from 77 minutes to 178 minutes.

Tabulation was made of the number of times the duplicate content units were categorized together. Only two of the 33 participating teachers did not place the duplicates in the same category. It was noted above that every set of units was randomized, so sorting the duplicates together was independent of the order in which the teacher encountered them. This observation verifies that teachers were very attentive to the task. Frequently, when a teacher encountered the second of the duplicate units, he would say "Oh, I read this before and put it in that category --is this included by mistake?" From such comments and observations, it seemed clear that the teachers were aware of the substance and structure of their own manifest categorizations.

TABLE 11.6

SUMMARY STATISTICS FOR SORTING EXPERIMENT 3
N = 32

Sorter No.	Sort Time	Resort Time	Cum. Time	# Categories
1	99	28	127	33
2	138	40	178	36
3	123	13	136	49
4	90	28	118	48
5	84	33	117	29
6	98	37	135	28
7	65	48	113	43
8	83	42	125	31
9	78	55	133	22
10	150	22	172	42
11	67	26	93	34
12	95	24	119	31
13	95	30	125	48
14	100	45	145	34
15	76	18	94	23
16	67	25	92	20
17	70	59	129	35
18	36	13	49	47
19	58	29	87	60
20	81	19	100	49
21	60	36	96	39
22	100	15	115	43
23	69	29	98	35
24	93	40	133	33
25	113	39	152	25
26	127	35	162	24
27	47	41	88	27
28	85	41	126	41
29	83	42	125	33
30	60	19	79	35
31	69	8	77	37
32	67	22	89	47
33	75	17	92	42
Mean	84.87	30.85	115.73	36.45
Standard Deviation	24.84	12.27	28.11	9.24
Range	36-50	8-59	49-178	20-00

CHAPTER 12

LATENT STRUCTURE OF TEACHERS' VIEWS

The design of the major sorting experiment was presented in Chapter 11. Thirty-two teacher-sorters were selected for this experiment according to the stratified sampling scheme described in Chapter 5. The task for each sorter involved manifesting categorizations of 128 content units which were derived from interviews. The manifest partitions of the 32 sorters were analyzed with Latent Partition Analysis (LPA), which is discussed in Chapter 7; and the results of this analysis are presented in this chapter.

There are three sections in this chapter. In the first section, the procedures employed in interpreting the LPA results are discussed. In the second section, the detailed compositions of the latent categories are presented, the content units are listed, and the LPA matrices are displayed. In the third section, comments are made on the substance and structure of the latent categories.

a. INTERPRETATION OF THE LATENT STRUCTURE

According to the latent partition model, there is a single latent categorization of the content units which is common to the categorizations of all the sorters. That is, it is assumed that a single categorization is sufficient to explain how each of the sorters performed the sorting task. It is assumed that each of the sorters operated according to a specific probability transformation function to derive his manifest categories from the latent categories. The latent partition model specifies certain structural arrangements of the latent categorization and of the probability processes; this is explained in Chapter 7 and in Appendix G. The latent partition model is a scientific, statistical model and is not necessarily a total and accurate explication of the sorting process. Rather, it was designed according to substantive hypotheses about the fundamental processes involved in the sorting and about the consequent basic features of the data.

The two major parameters of the latent partition model are matrices called Phi, the latent category matrix, and Omega, the confusion matrix. The Phi matrix specifies the compositions of the latent categories; it has as many rows as there are content units and as many columns as there are latent categories. Each row corresponds to a content unit; it has all 0's except in the column corresponding to the latent category of which the content unit is a member, and there its entry is 1. Equivalently, each column corresponds to a latent category and has all zero entries except in those rows which correspond to content units which are in the latent category, and for those rows the entries are all 1. The Omega matrix has as many

rows and columns as there are latent categories, and it is symmetric; each entry above the diagonal is equal to the corresponding entry below the diagonal. An entry in Omega corresponds to a pair of latent categories and summarizes the probabalistic processes of the sorters with respect to that pair of latent categories. Specifically, the entry is the probability, averaged over the sorters, that any pair of content units from that pair of latent categories will appear in the same manifest category. LPA is a computational scheme for producing estimates of Phi and Omega, given a set of manifest categorizations, and assuming that the LPA model is applicable to the input data.

The LPA computations were applied to the 32 sorter, 128 item sorting experiment. The computed estimates of the Phi and Omega matrices for this data are presented in the next section. They are estimates in two senses. First, the categorizations were obtained from a sample and not a population of sorters, so the Phi and Omega matrices computed are estimates of the corresponding population Phi and Omega matrices. Second, the model is an approximation to what actually took place in the sorting experiment and, from general scientific rationale, must be considered an imperfect model. The immediate consequence of the process of estimation is that the Phi and Omega matrices as actually computed do not have the precise structure that they theoretically should have according to the model. Especially, the Phi matrix is not a zero-one matrix; some entries are above one, many are between zero and one, and some are even negative. In order to make the general substantive conclusions concerning teachers' viewpoints from the results of the LPA computations, it is necessary to interpret the derived matrices. There are three general stages in this interpretation, and they are described in the paragraphs below. The first concerns selection from the various models possible within the LPA framework. The other two concern the substantive examination of the model which was chosen.

Selection of the Number of Latent Categories

The LPA computations are still being refined, and one major problem not completely resolved is that of estimating automatically the number, L, of the latent categories necessary and sufficient for describing a given set of sorting data. If L is set at a particular number, then the computational procedure of rotation produces estimates of Phi and Omega--which is to say, the parameters of a particular model for the sorting experiment. But different selections of L produce models which differ in how well the data are fit both mathematically and substantively. The LPA computations do yield (by means described in Appendix G) a rough estimate, called L, of the number of latent categories. This estimate has been found, empirically, to be imprecise, especially when the number of items is much larger than the number of sorters. Until the mathematical procedures are improved, the selection of the number of latent categories must be

made, in part, by ad hoc reasoning.

For the data from the major sorting experiment, the estimated number of latent categories, L = 42, was considered too high, so models with L = 42, 41, 32, 27, 22, and 17 were computed. The number finally selected was L = 32. For each of the six numbers tried, the corresponding Phi and Omega matrices were computed and visually inspected. Both Phi and Omega are supposed to be positive, for their entries represent zero-one assignments and probabilities. To the extent that they have negative entries, they are inadequate parameters for a latent partition model of the sorting experiment. With L = 42, 27, 22, and 17, there were large numbers of negative entries in the corresponding Phi matrices; and with L = 42 and 41, the corresponding Omega matrices had high negative entries. With L = 27, one latent category was null; its estimated number of items was only 0.6. With L = 32, there were fewer negative entries in calculated Phi and Omega, and there were no null categories. Among the selected values for L, Phi and Omega calculated on the basis of L = 32 provided the best approximation to parameters for a latent partition model of the data. Therefore, L = 32 was selected for the detailed substantive analysis which is presented in this chapter.

The content unit groups derived from the other models were compared with that for L = 32, certain categories of units were virtually identical across the models, while others appeared in various combinations and arrangements, and others were uninterpretable because of negative entries. The interpretations presented below depend on the acceptance of a particular model selected according to LPA procedures. Other models of the sorting experiment might also be viable.

Placing the Statements in Categories

Once it had been decided to have L = 32, the dimensions of the Phi matrix were fixed at 128 by 32, and those of Omega at 32 by 32. These matrices are presented on Foldout B in the next section. Because the entries of Phi are not strictly zero-one, an ad hoc system of interpretation had to be adopted in determining the compositions of the latent categories. The general philosphy was to consider the Phi matrix as defining an actual partition--a disjoint, exhaustive categorization of the statements. The entries in the Phi matrix are termed loadings. The largest loading for a statement is called the primary loading and others are called secondary loadings. In the interpretation, each statement was assigned to the single latent category on which it had its primary loading. Thus the partition was obtained. Within the framework provided by this partition, more detailed examination of the placements was made.

In Table 12.1 is presented a summary of the entries in Phi. There is one row in the table

TABLE 12.1

SUMMARY OF THE ENTRIES IN PHI FOR THE MAJOR SORTING EXPERIMENT

Latent Category	Estimated Number of Units	Number of Units assigned	Magnitude of Primary Loadings			Number of Secondary Loadings	
			90+	60-89	30-59	By Other Units On This Category	By These Units On Other Categories
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	3.7	4	2	1	1	1	1
2	7.0	9	3	3	3	1	4
3	3.7	3	1	1	1	4	-
4	4.2	4	2	1	1	1	1
5	4.1	4	2	1	1	1	1
6	4.9	6	2	1	3	-	2
7	4.5	5	2	2	1	2	1
8	4.3	6	1	3	2	-	4
9	6.0	6	3	1	2	2	1
10	4.4	4	1	1	2	5	1
11	5.2	5	2	3	0	2	1
12	3.8	3	2	0	1	3	1
13	4.0	5	1	3	1	2	2
14	2.3	3	2	0	1	-	-
15	4.4	4	3	0	1	1	1
16	2.1	3	1	1	1	-	2
17	2.9	2	2	0	0	-	1
18	3.7	4	2	1	1	-	1
19	3.4	3	1	1	1	2	3
20	4.9	5	2	3	0	2	1
21	3.2	4	2	1	1	1	3
22	2.2	2	2	0	0	-	-
23	1.9	2	2	0	0	-	-
24	3.4	5	1	2	2	-	3
25	2.9	2	1	0	1	4	-
26	5.3	6	2	2	2	3	4
27	6.2	5	3	2	0	2	1
28	2.4	2	0	2	0	2	-
29	3.1	2	2	0	0	-	-
30	3.6	2	1	2	1	1	4
31	3.6	3	1	1	1	3	3
32	4.9	3	2	1	0	4	2
Means	3.94	4.00	1.75	1.25	1.00	1.53	1.53

for each latent category plus one row for means. Column (1) gives the latent category numbers. Column (2) gives, for each latent category, the estimate, derived from LPA computations, of the number of statements in the latent category. This estimate varies from 1.9 to 7.0 and the mean is 3.94. Column (3) gives the number of content units assigned to each latent category--that is, the number of units which have primary loadings on that latent category. The numbers of statements assigned varied between 2 and 9, had a mean of 4, and agreed quite well with the estimated numbers. Columns (4), (5), and (6) give breakdowns of column (3) according to the magnitudes of the primary loadings.[1] Most of the primary loadings are in the 90+ range. Only one of the latent categories has no primary loading in that range, and on the average there are 1.75 units with such loadings on them. The two smaller ranges encompass the primary loadings of successively fewer statements, but even in the 30-60 range, the average per category is 1.00. Later, in trying to reach an understanding of these categories, the loadings in the three ranges were designated strong, moderate, and weak. Strong loadings were to be more valuable in understanding a category. There is, at present, only intuitive justification for this consideration except in the sense of ambiguity as explained below, but the designations seemed to make substantive sense for this particular data.

Some of the content units were not sorted consistently by all the sorters, at least not with respect to the derived set of latent categories. This is evidenced by the presence of units which have substantial loadings on several categories. Such content units are called ambiguous units. Columns (5) and (6) of Table 12.1 refer to ambiguous statements. For each latent category there appears in column (5) the number of secondary loadings greater than 30 for units assigned to other latent categories. For each latent category, the number of secondary loadings greater than 30 on other categories appears in column (6). The mean of each of these columns is 1.53, which indicates that a substantial number of content units had ambiguous loadings. For the purpose of interpretation, loadings of an ambiguous content unit statement are identified as probabilities in an extended latent partition model. The extension from the latent partition model, explained in Chapter 7 and Appendix G, may be formulated with a mathematical basis, though the formulation is not given here. It is assumed in the extended model that a sorter recognizes in an ambiguous unit just one of the possible latent categories for the unit and that this recognition is effected according to a probabilistic processthe probabilities of which the loadings are estimates. The recognition process is assumed to occur prior to the probabilistic process of sorting into manifest categories. Sorting into categories is assumed to be effected according to the latent category confusion probabilities estimated in Omega. Note

[1] The loadings are written without decimals in this chapter.

that the sorters were required to put each item in one and only one category, so they had to decide upon a single idea for a statement.

Describing the Categories

Since the 32 latent categories were considered a major finding of this research, it was necessary to annotate their presentation and to describe the understanding that has been reached of the substance and structure of the ideas underlying the categories. The goal of this annotation was to determine labels for the categories and to explain the relationships among the content units within a latent category and among latent categories. The data used in reaching the understanding consisted of a) the statements themselves, b) the Phi and Omega matrices, and c) the titles which sorters applied to their manifest categories. The scientific problem is similar to that of naming factors from a factor analysis. Factors are formally defined only in terms of correlations between variables and factors. However, in factor analysis, there is no parallel to the sorters' manifest category titles, which are of value for naming LPA categories.

The central idea of a latent category was first tentatively formulated on the basis of the strong-loading unambiguous content units assigned to the category. Usually, these statements exhibited a fairly obvious common concern, and an expression of this concern was adopted as a preliminary title for the latent category. The expression was then tested and modified as necessary in examining the other units assigned to the category. That is, the strong-loading units suggested the main idea of a category, and the weaker-loading units clarified and specialized this idea. By examining titles given by sorters to their manifest categories, refinement of the latent category title was possible. Consideration of the ambiguous content units helped clarify the subtleties of latent category meanings, since the shades of meaning which differentiated the categories were visible in ambiguous statements. The explanations of the various latent categories had ultimately to be aligned--the categorization is a function of the set.

Because of its utility in understanding the subtleties of the latent categories, the notion of ambiguity deserves further discussion. In some cases, ambiguous statements contain two or more ideas in coordination; perhaps they should then be considered bad items for a sorting experiment in which sorters are required to form disjoint categories. But several other item characteristics seem to be related to ambiguity:

a. Certain key words, such as drill and discipline, appearing in a unit may have distracted sorters from other substantive concerns of the statement.

b. Statements phrased in terms of a particular subject area may have been considered without regard to general aspects of learning and method they expressed.

c. Very long statements may have been confusing in the context of the large number of content units to be manipulated.

d. It may have been difficult to relate negatively worded statements to statements phrased in terms of positive actions and beliefs.

An empirical investigation of some of these factors is presented in Chapter 9, but certainly more investigation is needed. Also, there is some suggestion (see the third section of this chapter) that at least coordinate ambiguity is related to confusion or merging of the latent categories by the teachers who participated in the generation of the item pool.

The sorters' confusion (in the technical LPA sense) of latent categories is to be differentiated from ambiguity of statements. Ambiguity is inferred from several substantial loadings for a particular item in Phi, while confusion is inferred from substantial entries in Omega and refers to all the items from a pair of latent categories. Confusion and ambiguity are mathematically independent phenomena. Confusion involves a uniform probabilistic merging of the items of two latent categories and is regarded as the major manifestation of individual differences among sorters. Most of the entries in Omega are low; all are below 30,and only fifteen are between 10 and 29. This indicates that the sorters tended to divide latent categories rather than to combine them in arriving at their manifest categories. For the purpose of interpreting the confusion probabilities in Omega, only entries greater than 10 were considered, and they led to clarification of the understanding of the meanings of the latent categories. Several chains of categories were found to have high confusion probabilities and were interpreted as indicating a partial hierarchization of the latent categories. No psychological explanation of the hierarchization has been explained in terms of a psychological theory, but it does aid in organizing and presenting the confusion characteristics.

b. COMPOSITION OF THE LATENT CATEGORIES

The LPA results and interpretations for the major sorting experiment are presented in this section. Figure 12.1 indicates the physical arrangement of the presentation. The last page of this section is a large foldout which should be extended to the upper right. The foldout contains Phi and Omega along with the list of suggested latent category titles and a schematic representation of the more probable confusions. Descriptions of the latent categories and the statements comprising the latent categories are given on facing pages preceding the foldout. Content units and their numbers are grouped according to their placements in latent categories. Latent categories and their numbers are grouped so that categories with more probable confusions are adjacent. To study the results, latent category descriptions should be read and their contents examined. Ambiguities noted in the description may be checked with the Phi matrix on the foldout; and the confusions noted may be checked against the representations of the more probable confusions on the foldout.

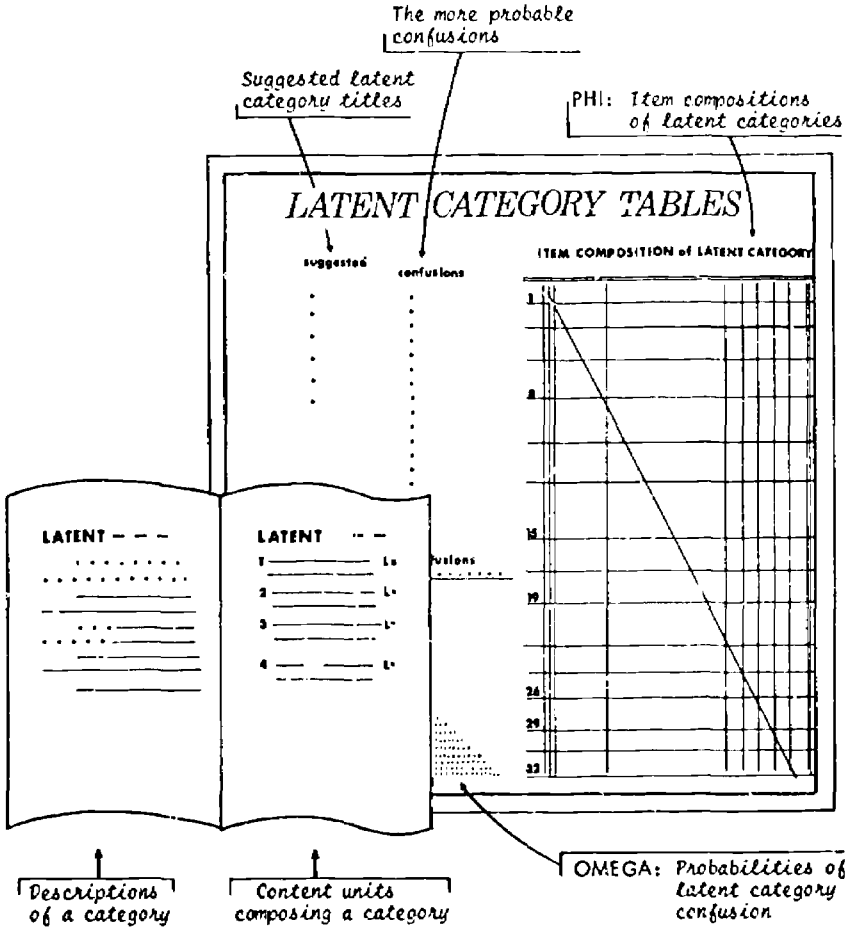

Figure 12.1. Arrangement of descriptions, statements, and Foldout B for study of latent categories.

The descriptions of latent categories consist of five parts: 1) the title for each category, 2) an expansion of the title, 3) a comment on the loadings of the statements assigned to the category, 4) a discussion and abstraction of the statements with respect to their common meaning, and 5) a discussion of confusions with other latent categories. Before proceeding to the descriptions, some examples of derivations are given, with respect first to statement ambiguity and second to category description. Here and in the rest of this section a general form of expression, L = x on Category y, will be used to symbolize a statement's loading of x value on Category y. Two pieces of information appear to the right of each statement: 1) the value of each statement's loading on its assigned category, and 2) the marking (amb.) to denote content units which have ambiguous loadings.

Examples of Ambiguity

This is Content Unit 83:

> This third-and fourth-grade teacher has her children work individually at their seats on their map skill books while she circulates around the room helping them. The work is corrected by each child as the teacher reads the answers.

This unit was assigned to Category 19: Pupil Initiative, but it has several fairly large secondary loadings. Its four largest loadings are:

L = 47 on Category 19: Pupil Initiative,

L = 37 on Category 27: Textbook Supplements,

L = 32 on Category 7: Individual Attention, and

L = 29 on Category 10: Variability in Teaching Approaches.

Certain key words and phrases in the statement are underlined here, but they were not, of course, underlined on the slips that were sorted. Each of the underlined words and phrases can be associated with one of the four categories, and the presence of these words and phrases is assumed to be the reason the statement was sorted ambiguously. Essentially, the item is a coordinate combination of several ideas.

A second ambiguous statement is Statement 64:

> This teacher does not believe in directing children's use of color in creating their own pictures.

It was assigned to Category 13: Structure of Language; but its primary loading was low, and it had several secondary loadings of comparable magnitude:

L = 30 on Category 13: Structure of Language,

L = 26 on Category 30: Students' Interests, and

L = 20 on Category 29: Reporting.

Apparently the negative wording of the statement led to an apparently arbitrary array of ambiguous assignments; for the purpose of the present experiment the statement must be considered a "bad" item.

These two examples of interpreting ambiguity illustrate the ways in which individual statements were analyzed. Such analysis is useful in understanding the content compositions of the statements and in understanding how the sorters may have focused on particular aspects of the statements. It is also useful in understanding the content of latent categories; this is illustrated in the following paragraphs.

Example of Description

Two high loading statements on Category 6 directly concern instilling citizenship. Statement 25 says that a teacher "teaches freedom" by indicating the importance of "cooperation and sharing;" Statement 26 says a teacher "stresses the importance of being a good citizen" by having students know governmental realities. A tentative title for Category 6 might be "Understanding Democracy."

The other four statements in Category 6 have weaker loadings. Statement 27 concerns individual problems, Statement 28 concerns rules and behavior, Statement 29 concerns leadership, and Statement 30 concerns committee operation. Modification of the title "Understanding Democracy" is necessary, for these weaker statements indicate that the inclusive content of the category involves more than just understanding democratic society, but it also involves understanding the social patterns in the classroom. The final title selected was "Good Citizenship" which is more global than "Understanding Democracy."

Thus the weak-loading statements clarify the idea extracted from the strong-loading statements. Also, an ambiguous statement may assist in the explication of the meaning of a category.

Statement 28 is:

> This teacher talks over rules and behavior, pointing out that more is expected of second graders than first graders because they are older and have been in the school longer.

The statement has a loading L = 55 on Category 6 and a loading L = 50 on Category 4: Discipline Problems. The phrase "more is expected" suggests discipline rather than social integration. Because that suggestion is apparently registered in the ambiguous loading on Category 4, there is indication that this category, "Good Citizenship," does not have disiplinary overtones. This is a further clarification of the category.

Statement 27, presented in Figure 12.2, is also in Category 6. The phrases appearing around the statement are actual titles assigned by teachers to their manifest categories which included this statement. Such terms as "Responsibilities" and "Teaching Understanding of a Society" tend to verify the

title,"Good Citizenship,"given the latent category. The variation among these titles indicates the manner in which sorters diversified (split) and confused (merged) latent categories. For example, several sorters considered Content Unit 27 a category by itself--one sorter called it "Understanding Oneself." But other sorters confused (merged) the category and produced such constructs as "motivation." In the confusion matrix, Omega, Category 6 has a low but persistent probability of confusion with Category 4: Discipline Problems, which in turn is confused, at a quite high probability, with Category 5: Personal Relationships. The existence of this chain further emphasizes the social and non-disciplinary nature of Category 6: Good Citizenship.

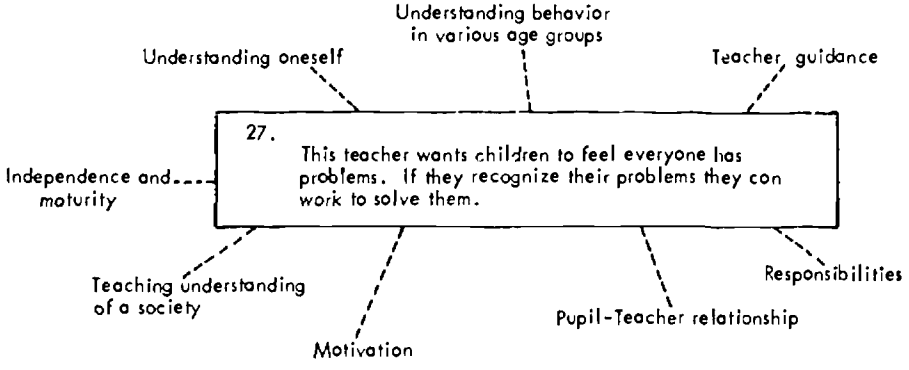

Figure 12.2. Titles assigned to manifest categories which contained Content Unit 27.

The latent category descriptions, content unit compositions, and Foldout 8 follow. In the section following the foldout, comments will be made concerning the use and the importance of these results.

LATENT CATEGORY 1. CORRELATING SUBJECTS

Subject-matter areas are correlated or integrated by the teacher. As he perceives that they can be meaningfully related, the teacher combines spelling and language, social studies and art, and so on.

Loadings. Four statements had their highest loadings on this category. Two of these loadings are strong; one is a moderate loading, and one statement is ambiguous.

Abstracted meaning. Key words in the four statements are "combines," "correlates," "relates," "integration." Note that the item contents cut across subject-matter areas: spelling and language; social studies and art; spelling and reading. The fourth statement is ambiguous. It contains an element of integration, but in the sense of integration between grade levels.

Confusion. This category is isolated in the confusion matrix.

LATENT CATEGORY 1: CORRELATING SUBJECTS

1. This teacher combines spelling and language. This is at the seventh-and eighth-grade level. L = 115

2. This teacher correlates social studies with art, such as drawing the Wilderness Road, what children thought it would look like. L = 114

3. This teacher feels that spelling relates to reading in the matter of syllabication and accents. If children can break a word into syllables, it will help them with their reading. L = 76

4. This third-and fourth-grade teacher is in close contact with the fifth-and sixth-grade teacher for science. They discuss what they teach in order to get good integration between the grade levels. L = 30 (amb.)

LATENT CATEGORY 2: VISUAL AIDS

Learning receptivity is strengthened through the use of visual aids.

Loadings. Nine statements are contained in this category. Three loadings are strong and three are moderate. Three items are ambiguous. Item 13 is unique in that it has identical loadings (L = 34) on three latent categories, 2, 13, and 31. Its content is most closely related to the concerns of this category.

Abstracted meaning. All nine statements concern the techniques of using visual aids to facilitate learning. These aids include filmstrips, pictures, blackboard, flannel board, objects, charts and flash cards as tools for teaching. Several of the ambiguous items also load on Category 3, which deals with the use of concrete examples. There was some ambiguity with respect to Category 10 which deals with variability in teaching approaches.

Confusion. The confusion matrix reveals a strong relationship between Categories 2 and 3. The items from both categories are concerned with the hardware of teaching and demonstration.

LATENT CATEGORY 2: VISUAL AIDS

5. This teacher uses filmstrips occasionally to illustrate a story and asks questions before showing it. She may use just part of the filmstrip to bring out something specific.	L = 118
6. This teacher uses filmstrips to teach a lesson which is difficult to visualize and branches out the discussion from the filmstrip.	L = 112
7. This teacher states that the first-grade teacher uses a lot of visual aids so that pupils can match sounds with pictures.	L = 111
8. This teacher believes in utilizing visual aids in arithmetic. She feels that the blackboard is the best visual aid for illustrating arithmetic concepts--both for the pupils and the teacher.	L = 87
9. This first-grade teacher used a flannel board to help a slow child in arithmetic. She also used calendar pages. The child took the calendar pages home with him to get extra help from his parents.	L = 76
10. This teacher says that memorization comes faster after they picture the facts with objects.	L = 60
11. This third-grade teacher uses the blackboard for review of words and word usage, for example: does, doesn't, do and don't. Children will write correct sentences on the board.	L = 46 (amb.)
12. This teacher in a rural situation, uses charts, experience charts, and flash cards even when teaching only the two students who make up the second grade.	L = 45 (amb.)
13. This teacher says the first grade previously handled objects before going into abstract ideas and number symbols of adding and subtracting.	L = 34 (amb.)

LATENT CATEGORY 3: CONCRETE EXAMPLES

Physical materials make the learning experience more real and comprehensible.

Loadings. Three statements load on this category , one relatively strong and two moderately.

Abstracted meaning. All three items in this category concern learning situations in which concrete objects are manipulated. The subtle distinction between this category and Category 2, which includes items about visual aids, was not clearly perceived by the sorters. Six of the nine statements in Category 2 have moderate to weak loadings on Category 3, and one statement in Category 3 loads on Category 2. Visual aids provide effective alternatives to concrete examples when examples cannot be produced in the classroom.

Confusion. The relationship with Category 2 is described previously.

LATENT CATEGORY 4: HANDLING DISCIPLINE PROBLEMS

Deliberate steps are taken to maintain control and minimize student disruptions.

Loadings. Four statements loaded on this category. Two loaded very strongly and two loaded moderately.

Abstracted meaning. Category 4 is one of three categories concerned with teacher-pupil relations and control of student behavior. (See also Categories 5 and 6.) The content of two statements reflects specific problems of student misbehavior. The other two describe opportunities for a teacher to prevent misbehavior.

Confusion. The confusions of this category with Categories 5 and 6 are especially interesting. The realm of student-teacher relations seems to be differentiated into three partitions. Categories 5 and 6 represent non-academic personal relations and good citizenship. The three categories appear as a constellation of "personal relations" in the confusion matrix.

LATENT CATEGORY 3: CONCRETE EXAMPLES

14. This teacher uses scraps of paper cut into inch squares for the concrete objects she uses in teaching multiplication facts in math because they are not noisy and take up little room. L = 95

15. This teacher tries to do some experiments in science. She feels that not having enough equipment will make o difference in teaching science because the text shows experiments using equipment that they do not have. L = 61

16. This teacher had difficulty with her fifth graders in understanding the difference between elements and compounds. They confused natural resources with elements. She used chemistry charts with abbreviations to show how elements compared to natural resources, and through experiments they finally seemed to understand. L = 50

LATENT CATEGORY 4: HANDLING DISCIPLINE PROBLEMS

17. This teacher sometimes writes down students' names on a paper on her desk for misbehavior, and then they both forget about it. L = 121

18. This teacher states that she takes those who just can't get along without disturbing others with her, if she must leave the room. L = 112

19. This teacher feels that children learn in the first week how far they can go with a new teacher, and they will try it. L = 81

20. This teacher tries diplomatically to get a child back on the track if he goes off on a tangent. L = 56

LATENT CATEGORY 5. PERSONAL RELATIONSHIPS

A satisfactory personal relationship with students is a significant teacher attribute.

Loadings. Four statements loaded on this category: there were three with strong loadings, and one statement was ambiguous. The ambiguous item (number 24) has a secondary loading on Category 25. In one respect, the item refers to a general rapport between pupil and teacher, which seems to explain its appearance in Category 5. The content of the item refers to specific interests, and thus it is related to Category 25.

Abstracted meaning. Whereas the emphasis in Category 4 was the handling of discipline problems, this factor pertains to a more subtle level of interaction. For instance, statement 22 is concerned with the mutual trust between the teacher and the child. This aspect of personal relations differs in kind from a "discipline" relationship in which the concern is for control of the children.

Confusion. Although there are three categories grouped together in the confusion matrix, Category 5 is significantly related to Category 4, the concern for adequate handling of discipline problems but not to ideas of leadership and good citizenship (Category 6). Possibly, a distinction was made between the teacher's viewpoint and the student's viewpoint. That is, Categories 4 and 5 assume the teacher's perspective: How will she manipulate students' behaviors and attitudes? Categroy 6 is concerned with helping students to assume responsibility, leadership, and cooperation.

LATENT CATEGORY 6. GOOD CITIZENSHIP

Instilling democratic ideas of good citizenship, cooperation, and leadership are an integral part of teaching.

Loadings. Six statements load on this category: three have strong loadings, and three items are ambiguous.

Abstracted meaning. The two strongest statements discuss good citizenship in general, while the others concern various aspects of social integration of the class: rules and behaviors, individual problems, leadership, and committee functioning. A significant attribute of this latent category is a concern for individual development.

Confusion. This category's link to Category 4 and its lack of connection to Category 5 has been noted. Although Categories 4, 5 and 6 are underscored by a dimension of personal relations, each factor remains independent in one particular aspect of this concern.

LATENT CATEGORY 5: PERSONAL RELATIONSHIPS

21. This teacher says you have to laugh with your children, and at yourself, but never at the children. L - 122

22. This teacher thinks it is very important that you like your children because you have to trust your children and they have to trust you. It has to be a mutual feeling. L = 116

23. This teacher would advise a cadet teacher not to get too friendly with the children immediately. You have to be on the same level, but not necessarily a "good fellow." L = 80

24. This teacher, whose hobby is earrings, gains children's interest by wearing a different pair each day. These rural children check on which kind she's wearing and are interested in her hobby. L = 47 (amb.)

LATENT CATEGORY 6: GOOD CITIZENSHIP

25. This teacher states that she taught freedom by showing pupils that they could have freedom to a certain extent but not by taking someone else's freedom. She pointed out that in playing baseball there must be cooperation and sharing in order for everyone to enjoy it L = 125

26. This intermediate teacher states that in history discussions she stresses the importance of being a good citizen, as children sometimes take things for granted. For example, they think a teacher pays for all the supplies, but she has pupils learn that the parents actually pay for them. L = 124

27. This teacher wants children to feel everyone has problems. If they recognize their problems, they can work to solve them. L = 75

28. This teacher talks over rules and behavior, pointing out that more is expected of the second graders than first graders because they are older and have been in school longer. L = 55 (amb.)

29. This teacher wants to help those who show evidence of leadership to have confidence and to use their leadership ability. L = 47 (amb.)

30. This teacher, in preparing students for working on a committee, discussed what a committee is, how a committee should function, and the importance of working on a committee. L = 45 (amb.)

LATENT CATEGORY 7: INDIVIDUAL ATTENTION

Individual needs can be met by establishing tutorial practices within the classroom.

Loadings. Five statements load on this category. Two statements have strong loadings, two statements load moderately, and one is ambiguous. It is interesting to note that three of the five items of this category had secondary loadings on Category 10.

Abstracted meaning. This category reflects teacher concerns for organizing opportunities for providing individual help. Of itself, the content comprises an aggregate of notions about individual attention accross a variety of situations.

Confusion. An interesting confusion triangle was formed between this category and Categories 8 and 10. The strongest tie was between Categories 7 and 10, Variability in Teaching Approaches. Category 8 is concerned with individual problems--particularly with respect to reading--and is labeled Specialized Teaching Techniques in Reading. Also interesting is a tangential link with Category 9 which will be discussed later. In contrast to Category 8, Category 7 is not "subject bound;" it is general and not directly relevant to any one specific subject-matter area. However, the similarity of orientation is apparent and is represented in the confusion matrix by a constellation of interrelated categories whose concerns range from general to highly specific matters of individual attention.

LATENT CATEGORY 7 : INDIVIDUAL ATTENTION

31. This teacher, who teaches a split grade, helps children during the noon hour and at recess, or after school becouse she doesn't have time during the day to give individual help. L = 116

32. This teacher sometimes gives individual reading help during penmanship period because there is no time at noon, and they all ride the bus which leaves promptly at 3:15. L = 111

33. This teacher divides the students during library and art time so that the students get more individual attention. L = 74

34. This teacher says children don't feel embarrassed by coming to the board for individual help because she does this in all her classes. Others who are not quite sure can watch and learn, too. L = 62

35. This teacher says in case of absences, she reviews the work they have covered in the group, she has the students take work home, or they stay in from recess and she helps them to catch up. L = 44 (amb.)

LATENT CATEGORY 8: SPECIALIZED TEACHING TECHNIQUES IN READING

Certain teaching schemes designed to provide individual attention to specific problems of readers may advance their progress.

Loadings. Six statements load on this category. One has a strong loading, and the rest have moderate loadings. Although the loadings of the last five items are moderately strong, each has a large secondary loading and may be considered ambiguous.

Abstracted meaning. Five of the six items describe variations in teaching procedures regarding specific problems of slow readers. However, this latent category appears not to be restricted only to slow readers. One moderately loading item describes a procedure for handling faster readers. This category seems to include two concerns: a flexibility in teaching approach for different ability levels, and techniques for teaching reading. The first concern is expressed in a more general form in Category 10, but this is not related in the confusion matrix to Category 8. The main emphasis of Category 8 appears to be varying ability levels. Implications of the statement sampling procedure have previously been described: certain ideas expressed by the interviewed teachers may have been omitted. Only one statement in this category describes "fast" pupils. Had this item not been included, the category may have been interpreted as attention to slow readers *per se*.

Confusion. Category 8 is related both to Category 7 and Category 9 in the confusion matrix. Category 7, as has been described, is illustrative of general ways of providing individual or special help. This idea is also predominant in Category 8. Category 9, on the other hand, exemplifies organization of reading instruction. Both of these concepts are apparently important attributes of this category. The triangle formed by Categories 7, 8, and 10 has been described.

LATENT CATEGORY 8: SPECIALIZED TEACHING TECHNIQUES IN READING

36. This teacher has Group II, the poorer readers, use a third-grade reader because it is necessary to try and pick up some things which they didn't pick up in the third grade, such as prefixes, suffixes, and so forth. L = 126

37. This teacher likes to have her slow readers do oral reading. She has them read to each other, such as two go in a corner and read to each other while she is having the other group read. She feels this helps them become better readers. L = 78 (amb.)

38. This teacher has a couple of boys in her room who are having difficulty in reading. She feels that their difficulty is a lack of vocabularly which prevents good comprehension. She feels they didn't have enough individual help in lower grades. L = 62 (amb.)

39. This teacher has her second reading group following much the same procedure as her first reading group only more slowly. L = 61 (amb.)

40. This teacher says the faster pupils go ahead on their own and she just checks them by having them read the new words to her. She scrambles the words around and inserts other words and this way she checks their obility. L = 53 (amb.)

41. The teacher will not let slow pupils leave until their work is finished. L = 46 (amb.)

LATENT CATEGORY 9: READING ORGANIZATION

A variety of instructional procedures are designed to involve children in reading and to develop reading skills.

Loadings. Six statements load on this category; three statements have strong loadings, one statement has a moderately strong loading, and two are ambiguous.

Abstracted meaning. An assortment of specific approaches or activities in reading organization comprise the items which load on this category. This is one of the few factors which are organized around a content area. The teacher activity or involvement in the classroom event described is unique to that area. That is, most latent categories cut across subject-matter areas. However, for these items, it is difficult to identify any attitude, method or approach which can be separated from Reading Organization.

Confusion. The position in the confusion matrix of Category 9 is indicative of its generality A weak link is established with Category 8, and the relation between them is the concern for teaching approach.

LATENT CATEGORY 9: READING ORGANIZATION

42. This teacher has oral reading following the guided reading if time permits. If not, they do the oral reading at the next reading class which would probably be in the afternoon. L = 131

43. This teacher has children take turns reading aloud or reading the part they like best. She emphasizes the expression they put into their reading. L = 114

44. This teacher requires an hour of reading a day in grades five through eight, with everyone reading at the same time. She does this in the afternoon. L = 102

45. This teacher devotes most of the time to reading because she feels it is most important in the third and fourth grade. She says on some days she spends the whole forenoon on reading. L = 74

46. This teacher had one of her reading classes read a story on "fact and fiction" and write the names of other stories they had read that were similar. She asked if they liked the story and why. L = 40 (amb.)

47. This teacher uses several techniques for her reading seat work. She uses thought questions, true and false, multiple choice, and yes and no questions. which she mimeographs. She also has the pupils, after they have read the story orally, draw a question from the question box and answer it. L = 37 (amb.)

LATENT CATEGORY 10: VARIABILITY IN TEACHING APPROACHES

The use of a variety of instructional methods helps resolve individual learning problems.

Loadings. Four statements load on this latent category. One loading is quite strong, two are moderate, and one is weak. Particularly significant was the relatively large number of strong secondary loadings for these items.

Abstracted meaning. Category 10 is interesting because it cuts across subject-matter areas. Four statements include one general concept: of these, two concern arithmetic, and one concerns letter discrimination. All four emphasize a need to try various methods to overcome particular learning difficulties. Category 10 seems to represent a concept which underlies many aspects of the teaching-learning situation.

Confusion. In the confusion matrix, this factor is specifically linked to Categories 7 and 8. This was explained earlier as an explicit tie to both general and specific teacher concerns. Further, this completes the only closed triad in the confusion matrix; that is, each category is linked with the other two.

LATENT CATEGORY 10: VARIABILITY IN TEACHING APPROACHES

48. This teacher, in desperation of teaching the difference between the b and d, told the class that the b comes first in the alphabet so that the line comes in front. She feels that each problem is an individual problem and she needs to try all methods for mastery. L = 91

49. This intermediate teacher helps children with individual needs in arithmetic by having them do some extra work or by making a chart to be sure they understand the mechanics of the skill. L = 67

50. This teacher feels her class can't take a straight diet of difficult material. She breaks it up by doing some sight reading or reading a play. L = 59

51. This teacher has someone read written problems orally so the class can decide how to solve the problem. Someone puts the problem on the board using the signs or skill to be used in working the problem. This is because some have trouble in reading and knowing what the problem asks for. L = 49

LATENT CATEGORY 11: DRILL

Drill and review are useful to firmly establish specific learnings.

Loadings. Five statements load on this category. One loading is strong, and the other four are moderately strong.

Abstracted meaning. The category is very clearly defined and represents general concepts of review and drill. Three of the five statements incorporate elements of subject-matter areas (arithmetic and spelling), but the overall concern seems to be generalized. The remaining two statements are centered strictly around the function of drill. In earlier LPA analyses, "drill" categories appeared as one of the most clear-cut and easily interpretable ideas expressed by the teachers.

Confusion. Category 11 is one link in a four-category chain dealing with learning drills. This link represents the most general of the ideas about review and drill. The next link, Category 12: Spelling, however, is specific with respect to certain practice activities. This in turn is linked to Category 13: Structure in Writing, which is linked to Category 14: Emphasis on Correct English Usage. These categories are linked together. Note that they are not interrelated. That is, Category 11 is not related, in this chain, to either Category 13 or 14, nor is Category 14 related to Category 12. These other three categories are subject-matter related. That they are "linked" rather than "clustered" may be a function of the differences among these areas. Words such as "drill,""repeat," and "review" carry strong connotations in themselves, regardless of their particular situational contexts. When these words appeared in the stimulus units to be sorted, they were consistently sorted together in the same manifest categories of the teachers. This connotative strength may account for lack of relationship, in the four-category chain, between Categories 11 and 13 and between Categories 11 and 14.

LATENT CATEGORY 12: SPELLING

A variety of instructional procedures provide practice in spelling.

Loadings. Three statements load on this category: two are strong-loading, and one statement is ambiguous.

Abstracted meaning. Category 12 describes techniques for teaching spelling. The ambiguous item also loads on Category 10: Variability in Approach to Solving Individual Problems, and Category 19: Pupil Initiative. Although the loadings are about the same, in the spelling context it fits most meaningfully in this category.

Confusion. This category is the second link in a chain of factors related to learning drills. It is connected with Category 11: Drill, and Category 13: Structure of Writing. These are both meaningful associations and were interpreted previously.

LATENT CATEGORY 11: DRILL

52. This teacher feels that even if it is old-fashioned, she believes in giving a review of the multiplication tables every week because pupils like it and can see themselves improve. L = 111

53. This teacher waits a couple of days, after concentrated work on a drill sheet, and then reviews the subject in which they had difficulty. L = 98

54. This teacher says the beginning teacher must allow enough time for children to get the material as suggested in the manuals and must repeat often, because giving a lesson one day isn't enough. You have to repeat and repeat and repeat, even in higher grades. L = 88

55. This teacher believes in drill to teach arithmetic facts, such as flash cards and the other games, because even in the new math they must have drill or they will go without learning the facts. L = 81

56. This second-grade teacher gives a list of new words in spelling and also review words that give the most difficulty. Each week different words are reviewed. L = 79

LATENT CATEGORY 12: SPELLING

57. This primary teacher has students practice spelling words and writing on the board. L = 100

58. This teacher would give children,having difficulty in spelling,more writing activities, such as using the spelling words in a story. L = 96

59. This teacher says she doesn't require looking up the meaning of words in spelling class unless no one knows the meaning or can use it in a sentence. It slows up the whole class,and they might as well learn from each other as from the dictionary. L = 35 (amb.)

LATENT CATEGORY 13: STRUCTURE OF LANGUAGE

Manipulation of words is an effective method for teaching sentence structure.

Loadings. Five statements load on this category. There is one strong loading, three are moderately strong, and one item is ambiguous.

Abstracted meaning. Three of the statements deal with teaching grammatical sentence structure. One statement involves practice in word usage. The other statement is ambiguous and seems unrelated to the other items loading on this category. Generally, this category involves the manipulation of words in writing and the structure of language.

Confusion. Category 13 is linked to both Category 12 and Category 14; the stronger tie is with Category 14. This can be explained on the basis of similarity of content. The central idea of Category 14 is correct English usage. In both Categories 13 and 14, as in Category 11 and Category 12, there is a notion of reinforcing the habitual usage of certain linguistic elements.

LATENT CATEGORY 14: CORRECT ENGLISH USAGE

Good English instruction is supported by insisting upon correct usage and concise vocabularies.

Loadings. Three statements load on this category. Two loadings are strong, and the third statement is ambiguous.

Abstracted meaning. This category implies an emphasis on correct English usage. The items pertain specifically to learning correct vocabulary in subject areas, learning correct terminology, and using correct English in children's speeches.

Confusion. This category is the last link in the learning-drill chain and is connected only to Category 13. They differ in level: Category 13 stresses a teacher's approach to teaching language structure, while Category 14 deals with pupils' usage of correct forms.

LATENT CATEGORY 13: STRUCTURE OF LANGUAGE

60. This teacher begins grammar with a skeleton sentence, maybe just two words. Then they add the trimmings, adjectives and adverbs, and along with all of it goes the definition. L = 114

61. This teacher tells the class that a diagram of a sentence is to grammar what a map is to a road system. L = 71

62. This teacher would teach descriptive words to her third graders by having them write an animal's name, and write sentences about that animal using the descriptive words. L = 65

63. This second-grade teacher teaches sentence structure by giving a sentence and then a phrase. She has the children compare the two for the understanding of complete meaning. L = 63

64. This teacher does not believe in directing children's use of color in creating their own pictures. L = 30 (amb.)

LATENT CATEGORY 14: CORRECT ENGLISH USAGE

65. This teacher states that children should learn the correct vocabulory for a particular subject because they might as well learn the correct term in the beginning and not have to relearn later. L = 95

66. This primary teacher teaches children to use correct terms such as period, comma, apostrophe. L = 90

67. This teacher insists on correct English when giving a play even though she has the children make up their own speeches. L = 45 (amb.)

LATENT CATEGORY 15: USE OF TESTS

Tests may be used to determine a child's academic niche.

Loadings. Category 15 is comprised of three statements with strong loadings and one moderately loading item which is also ambiguous.

Abstracted meaning. The three strong statements describe the value of tests for grouping children and evaluating their progress. An ambiguous item is related to this only as it reflects an opinion of speed tests. These items represent a cross-section of subject-matter areas.

Confusion. Category 15 is linked to Category 16 in the confusion matrix. The main concern of Category 16 is preparation, orientation, and organization for upcoming work. To the extent that this concern can be interpreted as a concern for the evaluation of a pupil's status, there is confusion between the two categories.

LATENT CATEGORY 16: READINESS TECHNIQUES

There is a complementary relationship between efficiency of learning and time of readiness.

Loadings. Three statements load on this category; two have moderately strong loadings, and two are ambiguous. One of the moderate items is ambiguous and has a strong secondary loading on Category 15, to which this category is linked in the confusion matrix.

Abstracted meaning. Both of the stronger statements contain ideas which relate to a teacher's evaluation of students for the purpose of determining their courses of study. That is, the teacher attempts to perceive the students' receptivity to learning.

Confusion. In conjunction with Category 15, this category represents teachers' evaluation of students.

LATENT CATEGORY 15: USE OF TESTS

68. This teacher states that the children are given regular standardized tests in order for her to make necessary groupings in reading. L = 116

69. This teacher learns about the children's progress through tests. She has the Weekly Reader Test and the Stanford Achievement Test. L = 112

70. This teacher uses tests and drills in the back of the book to establish where the child should start in arithmetic. L = 91

71. This teacher doesn't like time tests. She would rather have a child work at his own speed because she herself was no speed-demon. L = 59 (amb.)

LATENT CATEGORY 16: READINESS TECHNIQUES

72. This teacher believes the readiness period is mostly talking and getting the students over shyness, coloring rhyming words, and so forth. L = 99

73. This first-grade teacher gives readiness tests to determine whether children are ready to read. Some are ready before others and become bored and anxious. L = 79 (amb.)

74. This third-grade teacher states that the first week of school is mostly orientation, and she doesn't expect the children to be producing much, except to review some things they had learned before. L = 43 (amb.)

LATENT CATEGORY 17: DISCOVERY LEARNING

A teacher can effectively guide children to the solution of their problems without telling them the correct answer.

Loadings. Two statements have strong loadings on this category.

Abstracted meaning. The two statements are specifically concerned with helping students answer their own questions, and they deal with encouraging students to use discovery techniques. These items are very similar in content, are nearly identical; interpretation of the category beyond the exact content of these two statements is difficult. Many items contain "cues" associated with several concepts,but this is not true of Category 17.

Confusion. Category 17 is part of the three-factor grouping concerned with developing pupil initiative and independence. The bases for its link with Category 19: Fostering Pupil Initiative are the statements of training children to work independently. The strongest tie that Category 17 has is with Category 19. A second link is with Category 18, which concerns helping children learn to organize ideas and information. Having students learn to answer their own questions is one approach to helping children work independently.

LATENT CATEGORY 18: ORGANIZATION OF VERBAL MATERIALS

Notetaking and outlining are techniques of teaching students to organize their learning into orderly patterns.

Loadings. Four statements load on this category: two have strong loadings, one has a moderate loading, and one has a weak loading.

Abstracted meaning. This category includes statements on outlining, notetaking and organizing logical sequences. One statement describes a systematic procedure for gathering reference material. Another statement describes organization of experimental results. Because of the variety of situational ideas contained in these statements, the very general category title seems appropriate.

Confusion. This category is linked to Category 17 in the confusion matrix but is not linked to Category 19: Fostering Pupil Initiative. Both Category 18 and Category 19 are linked to Category 17. While Categories 17 and 19 illustrate specific techniques of training children to do their work independently, Category 18 exemplifies this same objective from the point of view of providing systems which are useful for the purpose of facilitating independent learning.

LATENT CATEGORY 17: DISCOVERY LEARNING

75. This teacher never tells students the right answer. She answers a question with a question or guides them on how to find the answer. L = 111

76. This fourth-grade teacher doesn't tell her children the exact answer but shows them how to find it by rereading or looking at illustrations in order to come to logical conclusions. L = 92

LATENT CATEGORY 18: ORGANIZATION OF VERBAL MATERIALS

77. This teacher is teaching students to take notes in the fifth grade. She will ask, "What is the important thing you want to get from this?" Notetaking is very important for outlining, and they do much of that. She uses the radio program to help in outlining because the program lends itself to outlining. L = 109

78. This teacher states that her fifth graders have had difficulty in putting a story in logical sequence. She has had to repeat and review in order for them to do it correctly. She feels that their learning to outline has helped in this skill. L = 108

79. This teacher had her class look up material on a particular subject out of at least two reference books. She suggests that the students cut paper into cards and write information on only one side. Then they can organize ideas, outline the information, and then write a story. She does this procedure because too many of the reports on subjects are copied word for word from an encyclopedia. L = 68

80. This teacher has children write experiments in a notebook listing materials, what they did with them, and describe what else could be used in an experiment. L = 43

LATENT CATEGORY 19: FOSTERING PUPIL INITIATIVE

One teaching objective is to encourage students to assume self-reliance in initiating their work.

Loadings. Three statements load on this category; one has a strong loading, one has a moderate loading, and one statement is ambiguous. This item was discussed previously as an example of ambiguity resulting from certain key words and phrases appearing in the statement.

Abstracted meaning. The two highest loading statements emphasize helping children do things on their own: to find information and to interpret direction. The third item also contains a notion of individual work, but as noted above, is ambiguous because it contains other concerns as well.

Confusion. Category 19 was described in relation to Category 17 in the confusion matrix.

LATENT CATEGORY 20: HANDWRITING OBJECTIVES

Handwriting standards are reinforced through practice and teacher example.

Loadings. Five statements load on this category; two have strong loadings, and three have moderate loadings.

Abstracted meaning. The two strongest statements emphasize a teacher's expectations of certain handwriting standards among her students. Some interesting information is revealed by noting the loadings of the more ambiguous statements on other categories. The third highest loading item, 86, is noteworthy because of its specificity to left-handed children. It also loads on Category 10: Variability in Teaching Approaches. It was perceived by teachers as relating both to a particular subject area and to a teaching approach. Another statement includes a concept of evaluation, as the teacher keeps penmanship papers to note the children's improvement. This item loads on Category 26; Encouraging Attempts for Improvement, Category 32: Displaying Student Models; and on Category 15: Use of Tests.

Confusion. This category is an isolate in the confusion matrix.

LATENT CATEGORY 19: PUPIL INITIATIVE

81. This teacher tries to lead second graders, by the end of the year, to find out more information on their own from dictionaries and encyclopedias instead of depending entirely on her telling them. L = 101

82. This teacher states that students can be made aware of directions by having to read them for themselves; then, if they have questions she will help them. L = 84

83. This third-and fourth-grade teacher has her children work individually at their seats on their map skill books while she circulates around the room helping them. The work is corrected by each child as the teacher reads the answers. L = 47 (amb.)

LATENT CATEGORY 20: HANDWRITING OBJECTIVES

84. This teacher stresses neatness in handwriting rather than slant because she feels that by the time they reach sixth-grade they have established their writing pattern. L = 126

85. This teacher expects second graders to be neater and to print better than first graders. She would like to begin cursive writing in the second grade, as some are ready. L = 112

86. This teacher finds that teaching left-handed children to write is hard but sees that they have their papers the same as a right-handed person so that they will not write backhanded. L = 72

87. This teacher, in handwriting, tries to set the best possible example by her own writing on the board. L = 61

88. This teacher has children keep penmanship papers for a half year or a full year in folders so they can compare what they did at the beginning of the year. She wants them to see their improvement. L = 60

LATENT CATEGORY 21: USE OF PHONICS

Recognition and spelling of words is closely related to the recognition of sounds.

Loadings. Four statements load on this category. Two have strong loadings, two have moderate loadings; one item with a moderate loading is also ambiguous.

Abstracted meaning. This category is solely concerned with phonics. Even the two ambiguous statements are primarily concerned with auditory discrimination. None of the ideas are related to teaching reading, as might be expected. However, spelling is mentioned. In fact, one statement has a secondary loading on Category 12: Spelling.

Confusion. Although confusion with categories concerned with reading and spelling might have been anticipated, this category is an isolate in the confusion matrix.

LATENT CATEGORY 22: PARENTAL ASSISTANCE

Individual teachers must decide whether or not to invite parents to help students with their homework.

Loadings. Two statements load on this category. Both have strong loadings.

Abstracted meaning. Category 22 includes a particularly interesting pair of statements: each describes an alternative approach to the idea of parental assistance with homework. It will be recalled that when sorters were instructed in this task, an emphatic attempt was made to encourage teachers not to make value judgments about the nature of the teacher practices described in the statements. If two statements represented one major concern of facilitating learning, even though they were perhaps diametrically opposed in approach, the teachers were not to put "good" practices in one category and "bad" practices in another. Rather, they should put the two items together. Interpretation of the results of this study, as an indicator of the structure of teachers' perceptions of the teaching-learning process, requires that the sorting instructions were clearly understood. Here, then, is one bit of evidence that this was actually the case. The two statements comprising Category 22 are, in fact, contradictory in terms of desirability of parental help with children's homework; yet they were put in one category with sufficient consistency so that the two items had near zero loadings on other categories.

Confusion. This category is an isolate in the confusion matrix.

LATENT CATEGORY 21: USE OF PHONICS

89. This teacher says some first graders have difficulty in spelling because they can't recognize letters or they don't know the sounds. L = 104

90. This first-grade teacher thinks that "sounds" are most difficult to get across because pupils haven't had any previous experience with them. L = 90

91. This teacher teaches second-grade spelling by using sounds, rhyming words, building words, and she reviewed the consonants at the beginning of the year. She used the alphabet to place the letters correctly. They know b comes before d in the alphabet but they need a review for such letters as b and d. L = 66

92. This first-grade teacher in teaching visual and audio discrimination might put black and back on the board and ask if they see any difference. She then points out the difference. L = 50 (amb.)

LATENT CATEGORY 22: PARENTAL ASSISTANCE

93. This teacher never gives permission to take the worksheets home because she doesn't want parents doing the work or helping too much. L = 108

94. This teacher gets parents to help as much as possible when students have difficulty with school work because it is easier for the teacher to work with the student when the parent backs him up. L = 92

LATENT CATEGORY 23: FIELD TRIPS

Field trips can help make the subject-matter content realistic to the students.

Loadings. Two statements have strong loadings in this area.

Abstracted meaning. The two statements which comprise this category are examples of two specific instances of a teacher's use of field trips. The limitations of content sampling could have had a significant influence on a category such as this one. "Field Trips" might elicit notions of real experiences for facilitation of learning, applications of social studies, or expanding horizons. But the contents of these two statements in themselves imply nothing more than "field trip." For instance, no reference is made to children's evaluation of the experience, their reaction to related classroom discussion, or teacher's evaluation of the experience. One question left unanswered is: Do teachers think of field trips in isolation from other aspects of teaching behavior? This might be an example of the effects of the salience of key words--in this case, "field trip"-- in determining categorizations.

Confusion. This category is an isolate in the confusion matrix.

LATENT CATEGORY 24: NON-DIRECTED ACTIVITIES

Students' spare time may be directed toward special needs, interests, or activities.

Loadings. Five statements load on this category. Three statements have strong loadings; two statements are extremely ambiguous.

Abstracted meaning. Category 24 concerns children's use of free time when they have completed their assignments. There are two ambiguous statements included in this category. While their content is not directly related to free time, they are concerned with extra activities. Their loadings are such that secondary loadings are of equal magnitude to the primary loadings.

Confusion. In the confusion matrix, Category 24 is linked to Category 25 which directly concerns reading to the class. The connection appears to be an expression of a dimension of techniques in the use of supplementary activities and materials.

LATENT CATEGORY 23: FIELD TRIPS

95. This teacher says students didn't grasp that all people are workers, so she took the students on a trip downtown. She had them observe that there were many workers, and everybody is needed, even such as the street workers. L = 97

96. This first-grade teacher scheduled a trip to a shopping center where the class rode on an escalator and an elevator, used an electric eye door, had a treat in a drug store, and went to the airport. L = 91

LATENT CATEGORY 24: NON-DIRECTED ACTIVITIES

97. This teacher lets the class read library books if they have finished with a subject early. They have an hour a week to go to the library, select a book, and read. L = 95

98. This teacher states that there is no problem of a child keeping busy while she is working with another group because they can work on spelling words, on individualized reading, library books, phonics drills, and their creative writing. L = 83

99. This second-grade teacher has acquired many sample books from arithmetic companies which she cuts up and pastes materials from these books on cards. This is to be used by class pupils who have finished the planned curriculum. The child chooses the cards or problems he wants to do, for example, one on Roman numerals. He works these problems and hands them in to be checked. L = 75

100. This teacher will sometimes make a worksheet similar to a workbook page to follow through some work, if the class is having trouble. L = 38 (amb.)

101. This teacher felt their current events magazine encouraged the reading of the newspapers. L = 30 (amb.)

LATENT CATEGORY 25: READING TO THE CLASS

Selected materials can be effective and motivating when read to the class.

Loadings. Two statements load on this category; one has a strong loading and the other is extremely ambiguous. A secondary loading for item 103 of -45 on Category 3 is interpreted as lack of fit of the mathematical model.

Abstracted meaning. The two statements loading on Category 25 concern reading to the class. One statement loads very highly, and the other loading is small. It seems that the phrase "has children use supplementary materials as individuals or in groups" provides a content clue to help explain the discrepancy between the magnitudes of the two loadings. The idea of reading to the class was of sufficient salience that these two statements coalesced as a category. One could postulate a dimension of specificity of technique or operation, rather than a materials dimension, as the theme of this category.

Confusion. This category was discussed as it related to Category 24 in the confusion matrix.

LATENT CATEGORY 26: ENCOURAGING IMPROVEMENT

A general goal is to instill in students a desire for excellence.

Loadings. Six statements load on this category. Two loadings are strong, three are moderately strong, and one is weak. A particularly unusual characteristic of this category is that all statements have strong secondary loadings. This is true even of the very high loading statements.

Abstracted meaning. Generally, the statements involve encouraging students to improve and compete for high grades. However, one of the two highest loading statements appears to be irrelevant in this context. It fits only when the category concept is modified and expanded to describe establishing a mental set for proceding with school work. However, this modified idea provides an unsatisfactory account of the content of the other statements. While two of the six items have significant secondary loadings on Category 32: Displaying Student Models, none are apparently related to the conceptual content of that category. The ambiguity may stem from a general component of inducing motivation in students. The specificity of content in Category 32 became the focus of categorization by the sorters. As the concept of motivating students became more general, items in Category 26 became ambiguous.

Confusion. This category is an isolate in the confusion matrix.

LATENT CATEGORY 25: READING TO THE CLASS

102. This teacher has children use supplementary materials as individuals or in groups. Sometimes she reads materials to the whole class if the materials are not readily available. L = 106

103. This teacher reads to the students because they enjoy it so much, and it gets them to hear something they wouldn't read for themselves. L = 45 (amb.)

LATENT CATEGORY 26: ENCOURAGING IMPROVEMENT

104. This third-grade teacher stresses paragraph writing in all subjects so they are very conscious of what makes a paragraph. She tells the pupils that it would not be an honor roll paper unless it is correctly done. L = 95

105. This first-grade teacher uses a short build-up lesson in the morning to prepare for the main arithmetic lesson in the afternoon. L = 95

106. This teacher tells fast students who make careless mistakes that the students who work slowly are getting better grades than those who work so fast. L = 68

107. This teacher uses a set of rules called "A Dozen Steps to Better Grades." She thinks these rules make the student more conscientious about studying. They take out books to study more often, and at various times during the day. L = 66

108. This teacher grades language on good use of capitalization, punctuation, and whether they do good compositions. L = 54

109. This teacher feels a little competition is good sometimes. For example, committees try to give reports that are just as well done as the reports of other committees. L = 41

LATENT CATEGORY 27: TEXTBOOK SUPPLEMENTS

Teachers use a variety of manuals, workbooks, and other supplementary materials.

Loadings. Five statements have strong loadings on this category. One item also has a moderately strong loading on Category 3: Concrete Examples.

Abstracted meaning. This category pertains to teachers' use of special materials. Four of the items give no description of how teachers use materials, or for what purpose; it is merely acknowledged that they are used. The ambiguity of statement 114 is apparently a result of an observation on the function of materials as suggesting procedures and giving examples; thus, it is ambiguous with Category 3: Concrete Examples.

Confusion. This category is an isolate in the confusion matrix.

LATENT CATEGORY 28: ORGANIZING CLASS TIME

A teacher organizes a classroom so that several activities can be affected simultaneously.

Loadings. Two statements load on this category; both have moderately strong loadings. Statement 116, which deals with testing, also has a moderately weak loading on the testing category, Category 25.

Abstracted meaning. This category concerns classroom logistics; that is, there is a need to manage one group's activity while working with another group. An ambiguous statement in Category 8 has a secondary loading on this factor: "This teacher will not let slow pupils leave until their work is finished." This is a class time management problem. Item 124 in Category 31 also has a strong secondary loading on this category: "This teacher anticipates arithmetic difficulties and allows enough time to teach it and reteach it." The element of classroom logistics is clear in this item.

Confusion. Category 28 is linked to Category 29: Reporting in the confusion matrix. The highest loading statement on this category relates to logistic problems: "... three reports in one day because there isn't time for more with questions and discussion following." This statement is ambiguous and also loads on Category 28. Through this connection, and in terms of a general concept of "organization of activities," these categories are related.

LATENT CATEGORY 27: TEXTBOOK SUPPLEMENTS

110. This teacher has new materials on the board each day, and study sheet material is new each day. L = 113

111. This teacher just follows the spelling workbook. L = 103

112. This teacher feels that the seventh-grade social studies workbook contains geography and history and that she must use selected portions because there is so much material in the books. L = 90

113. This teacher says she knows the supplementary books they read very well, having read most of them herself. This is the best way to know what the children are reading. L = 82

114. This teacher finds that the manual helps in arithmetic by suggesting procedures, giving examples and further ideas for drill and individual work. She does not use all the suggestions. L = 74

LATENT CATEGORY 28: ORGANIZING CLASS TIME

115. This teacher has the third grade work on assignments in arithmetic while she works with the fourth grade. In this way not very many ever have to take work home. L = 77

116. This teacher, when giving a test to one group, has vocabulary helps and extra work on the board for the other group because she wants everyone to work quietly for the benefit of those taking the test. L = 64

LATENT CATEGORY 29: REPORTING

Individual reports can be an integral part of teaching social studies.

Loadings. Two statements load on this category; both loadings are very strong.

Abstacted meaning. Both statements are specific and regard the use of reports in social studies. Whether this idea should be expanded to include reporting in general is not clear, due to the particular sample of items sorted. That is, the sample of items to be sorted did not include statements regarding 'reporting' in any context except social studies.

Confusion. This category is related to Category 28 in the confusion matrix, and was discussed previously.

LATENT CATEGORY 30: STUDENT INTERESTS

Meaningful learning experiences can be devised from individual students' interests.

Loading. Four statements load on this category: there are two strong loadings; one item has a moderate loading; and one item is ambiguous with a weak loading.

Abstracted meaning. The strongest loading item can clearly be interpreted as the facilitation of learning by capitalizing on student interests. While the remaining statements can also be viewed in this context, they have complex patterns of secondary loadings and interpretation may be tentative.

Confusion. Category 30 is an isolate in the confusion matrix.

LATENT CATEGORY 29: REPORTING

117. This teacher has about three reports in one day in social studies because there isn't time for more with questions and discussion following. L = 109

118. This third-grade teacher sometimes had a social studies lesson in form of reports given by individuals. L = 105

LATENT CATEGORY 30: STUDENT INTERESTS

119. This teacher allows a child to go off on a tangent of his own interest if he can get his other work done. Children generally learn well when they are especially interested. L = 109

120. This teacher states that boys have a different attitude towards school and finds that they do better work when they have subjects that are especially interesting to them, for example: Eskimos or experiments. L = 78

121. This teacher encourages sixth graders to bring in rock collections, fossils, and so forth because it makes them want to find out where the rocks and fossils came from. L = 64

122. This third-and fourth-grade teacher allows children to get up and look up something in the encyclopedia during a discussion of the material, providing not too many go at one time. L = 37 (amb.)

LATENT CATEGORY 31: SEQUENCING ARITHMETIC

Student difficulties with orithmetic ore often functions of the sequencing of instruction.

Loadings. Three stotements load on this cotegory. One loading is strong, one is moderate, one is weak, ond the last two statements are ambiguous.

Abstrocted meoning. The central concern of this category is hondling arithmetic problems. However, on important aspect of the concept of this category appears to be the concern for sequences of instruction. One source of support for this aspect is thot the strongest loading stotement very explicitly deals with sequencing. Another bit of evidence derives from the content of item 38, which had a significont loading (L = 48) on this category, even though it wos assigned to membership in Category 8: Specialized Teaching Techniques in Reading. The content of this statement is "This teacher has o couple of boys in her room who ore hoving difficulty in reading..she feels they didn't hove enough individuol help in lower grades." The importance of instructional sequencing appears to occount for the item's relotively high secondary loading on Category 31. Further support of this interpretation is offered by the presence of Content Unit 4 (the primory loading of which is on Category 1) and stotement 13 (the primary loading of which is on Category 2). Both have orientations similor to that of s totement 38. Statements 124 and 125 ore so ombiguous thot they are given little weight in interpreting the meoning of the category.

Confusion. This category is on isolate in the confusion matrix.

LATENT CATEGORY 32. DISPLAYING STUDENT MODELS

Effective bulletin board projects stimulote children ond serve os models for student work.

Loadings. Three statements load on this cotegory. Two statements have very strong loadings, and the third stotement has o moderately strong loading.

Abstracted meaning. Two of the three items portray the use of bulletin boards in the classroom. They are described in terms of specific functions to enhonce the learning otmosphere. Specifically, the work of the students is emphasized. The third statement, though it is ombiguous and irrelevant with respect to ideas on bulletin boards, gives o further example of reinforcing children's accomplisnments. In this item, the matter is penmanship phroses constructed by the children. Its secondary loading is on Category 20: Handwriting Objectives. Item 128 has o negative loading of 53 on Category 26, which should be interpreted as an error in fit of the mathematical model of LPA.

Confusion. This category is on isolate in the confusion matrix.

LATENT CATEGORY 31: SEQUENCING ARITHMETIC

123. This teacher says you can have a lot of problems in second-grade arithmetic if the pupils haven't had the first-grade arithmetic according to the new arithmetic methods. The first-grade arithmetic in the new program goes farther than conventional methods, and the pupil who starts it new in the second grade will be behind. L = 103

124. This teacher anticipates arithmetic difficulties and allows enough time to teach it and reteach it. L = 68 (amb.)

125. This teacher helps her pupils find key words in arithmetic word problems that will help them in thinking through the problem. L = 42 (amb.)

LATENT CATEGORY 32: DISPLAYING STUDENT MODELS

126. This primary teacher utilizes the bulletin board as a means for stimulating interest in good work. She tries to put up new papers each day, striving to represent the work of all children at some time. She feels that if you do not continually stress good work and neat papers, children become careless and sloppy. L = 125

127. This teacher did not have bulletin boards decorated when the children first came to school. She wanted the children to decorate the room so that they would have the feeling that it was theirs. L = 119

128. This teacher for a penmanship lesson writes one or two sentences on the board that the first-grade children make up. L = 62 (amb.)

Foldout B:

LATENT CATEGORY TABLES

LATENT

Suggested Category	Latent Titles	and	The More Probable Confusions
1)	Correlating subjects		1
2)	Visual aids		2 --- .9 --- 3
3)	Concrete examples		
4)	Handling discipline problems		4 --- .25 --- 5
5)	Personal relationships		4 --- .10 --- 6
6)	Good citizenship		
7)	Individual attention		7 --- .15 --- 8 --- .10 --- 9
8)	Specialized teaching techniques in reading		7 --- .19 --- 10
9)	Reading organization		8 --- .12 --- 10
10)	Variability in teaching approaches		
11)	Drill		11 --- .13 --- 12 --- .11 --- 13 --- .18 --- 14
12)	Spelling		
13)	Structure of language		
14)	Correct English usage		
15)	Use of tests		15 --- .14 --- 16
16)	Readiness techniques		
17)	Discovery learning		17 --- .12 --- 18
18)	Organization of verbal materials		17 --- .17 --- 19
19)	Fostering pupil initiative		
20)	Handwriting objectives		20
21)	Use of phonics		21
22)	Parental assistance		22
23)	Field trips		23
24)	Non-directed activities		24 --- .11 --- 25
25)	Reading to the class		
26)	Encouraging improvement		26
27)	Textbook supplements		27
28)	Organizing class time		28 --- .10 --- 29
29)	Reporting		
30)	Students' interests		30

NT CATEGORY TAB

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18 14

Item Composi

	Statement Number	Latent										
		1	2	3	4	5	6	7	8	9	10	1
	1	115	0	-2	1	0	2	1	-1	-8	3	
	2	114	-2	4	1	-0	-0	-0	-0	-1	0	
	3	76	-0	-1	-1	2	2	2	2	18	-8	
1	4	30	-3	4	0	-0	11	1	-2	4	-7	
	5	0	118	-20	-1	0	0	0	4	-7	-7	
	6	-1	112	13	-0	-1	-1	6	3	-1	-13	
	7	-4	111	-8	2	-0	0	-5	-7	2	13	
	8	-1	87	44	-1	-0	-2	5	-1	3	-10	
	9	0	76	26	-0	-1	-1	1	28	2	-7	
	10	12	60	-23	3	-2	5	-10	-19	-3	24	
	11	-0	46	26	-0	-0	5	-0	-4	2	5	
	12	-3	45	36	1	1	2	6	4	-5	-1	
2	13	-1	34	27	1	-4	10	-9	-14	-0	23	
	14	1	3	95	-4	4	-2	-2	-3	5	13	
	15	0	-5	61	0	-0	-3	3	-6	6	-3	
3	16	5	27	50	0	2	-1	-0	-3	2	2	
	17	1	1	-3	121	-8	-7	-1	1	-0	1	
	18	1	-0	-1	112	-16	3	-2	-2	1	6	
	19	1	1	-1	81	32	-14	0	0	-1	-4	
4	20	-3	-4	9	56	7	20	11	4	1	-21	
	21	-1	-2	2	-9	122	-2	-1	2	-1	-2	
	22	-0	1	-1	-10	116	2	-1	-1	-1	1	
	23	2	-2	5	26	80	-14	-2	-7	3	8	
5	24	1	10	-18	-0	47	-10	-2	2	-6	2	
	25	1	-1	0	4	-6	125	-5	-3	1	9	
	26	4	2	-4	-11	-5	124	-3	-5	-1	-2	
	27	-6	-4	2	3	20	75	10	6	-0	-26	
	28	-5	-5	10	50	10	55	5	4	-1	-19	
	29	-6	3	-5	-12	12	47	5	11	-3	8	
6	30	-5	-0	-2	-9	-1	45	-6	10	-9	9	
	31	1	4	-0	-2	-2	-4	116	-20	12	-19	
	32	-0	0	-1	1	-3	-4	111	-2	0	11	
	33	3	-5	1	0	-1	-6	74	23	7	36	
	34	-2	-2	7	-6	11	24	62	3	-6	26	
7	35	-2	3	-4	1	-3	2	44	1	3	-25	
	36	-1	-0	0	-0	0	-5	-9	126	-15	-2	
	37	2	3	-1	-2	-1	5	-11	78	60	0	
	38	-3	-2	0	-1	-2	-1	21	62	-3	-21	
	39	1	9	-4	-4	1	-2	-9	61	33	10	
	40	-1	10	-15	0	1	-3	-13	53	-10	42	
8	41	-1	7	-5	22	-4	-6	8	46	-4	-12	
	42	-1	-3	9	0	-2	-3	9	-6	131	-8	
	43	-5	-1	1	1	-1	2	-4	2	114	6	
	44	-3	7	-18	0	0	3	3	-4	102	4	
	45	7	-13	20	-5	6	-5	3	1	74	8	
	46	-0	5	-11	0	-1	1	6	4	40	-12	
9	47	-4	-12	14	0	2	3	-11	9	37	22	
	48	0	-14	17	3	2	4	-2	-14	1	91	
	49	2	-10	3	2	1	-3	50	22	-11	67	
	50	-2	12	-24	9	1	5	-11	-11	17	59	
10	51	5	-8	15	0	-3	5	-8	17	8	49	
	52	-0	-0	-5	-1	-3	-2	-1	-5	1	1	
	53	0	-5	3	-1	-3	0	-2	7	0	16	
	54	-2	1	-3	0	6	-1	3	-6	3	-10	
	55	-2	-2	15	-0	-2	-1	-5	-7	5	6	
11	56	1	2	-5	-2	-1	-3	1	17	-7	-17	
	57	-5	6	3	2	-1	3	-8	-15	6	21	
	58	14	7	-13	-3	4	-2	6	16	-8	-16	
12	59	1	1	-9	2	-2	12	-8	-5	9	30	
	60	7	-1	4	1	2	-5	-1	-1	2	5	

Composition of Latent Categories

Latent Category Number

8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	
-1	-8	3	-0	5	12	-3	-2	2	-4	5	-2	-1	-3	-1	-2	-3	7	-3	-5	7	-3	-4	-3	2	1
-0	-1	0	-1	-4	-13	2	-0	3	6	-1	-3	-2	-10	0	0	3	-6	2	-7	-4	2	-0	11	4	2
2	18	-8	1	12	-9	-2	2	-9	-3	-5	11	0	39	2	0	-2	-5	-0	22	-3	-2	2	-22	-10	3
-2	4	-7	-4	-3	-7	0	1	-2	-8	7	1	-0	-3	0	-3	-1	-3	1	8	-3	2	7	29	4	4
4	-7	-7	-4	11	-2	-0	-1	6	8	3	-2	-1	-6	-5	-4	12	9	-6	-3	7	-3	1	-3	8	5
3	-1	-13	-2	7	-4	-1	-0	3	1	-5	-3	-2	-10	-1	-2	-9	8	6	-11	1	6	2	-3	-1	6
-7	2	13	3	-10	15	-8	1	-1	-3	-5	10	2	22	-2	2	2	-10	-7	-8	-0	4	-1	-4	-4	7
-1	3	-10	-3	5	-9	0	0	3	-6	-1	0	-0	-7	-1	1	-0	0	3	-2	-2	-3	-6	3	5	8
28	2	-7	-6	3	-5	0	-3	-4	-3	-2	-0	-4	-10	16	-6	-14	-5	7	-8	4	-1	-1	11	2	9
-19	-3	24	4	-3	8	-0	1	2	-1	2	14	-4	-1	-2	4	0	-20	6	10	-7	9	8	7	-1	10
-4	2	5	19	12	-12	14	3	-3	-1	8	-9	-1	1	1	-1	4	-4	-12	-7	-4	-2	-6	-10	19	11
4	-5	-1	4	17	-11	9	-2	1	-1	7	-9	1	-5	-0	-5	9	8	-7	26	-6	-9	-7	-12	4	12
-14	-0	23	6	-17	34	-12	-0	6	-9	-8	7	-4	5	-0	11	-4	-9	7	-2	-10	7	0	34	3	13
-3	8	13	-2	-11	5	0	-1	-4	-0	-3	-5	3	-2	-2	-1	1	11	4	7	6	-5	-5	4	-5	14
-6	6	-3	-1	-7	4	-1	2	-3	3	3	-10	2	2	0	2	-6	14	-3	13	-8	-2	24	8	-10	15
-3	2	2	-3	-1	-5	-3	2	-2	12	6	-13	6	-0	0	7	2	-8	6	26	-12	8	2	7	-23	16
1	-0	1	-2	-0	-1	2	1	-2	-2	3	-2	-1	-1	-0	0	-0	0	-2	6	-3	-3	-2	2	-1	17
-2	1	6	-2	1	-0	1	-0	-2	-4	2	-1	0	-2	-1	1	-2	1	-4	-1	5	-6	-1	3	0	18
0	-1	-4	3	-1	-1	-1	-2	7	-1	1	2	1	-0	-4	-1	-4	2	3	1	-5	2	2	-4	-2	19
4	1	-21	7	-3	12	-3	[illegible]	4	13	-9	-2	-3	5	2	-3	15	-8	1	-12	0	10	8	-7	1	20
2	-1	-2	-2	3	2	-2	-1	-0	-0	-2	0	-1	0	1	1	4	-4	-3	-1	2	2	-9	0	3	21
-1	-1	1	-1	1	1	1	0	0	-1	2	-2	-0	-0	1	1	-2	1	-6	3	1	-3	0	-0	-2	22
-7	3	8	3	-4	-5	-2	0	1	-1	-1	3	2	4	-0	-3	-6	-1	10	-7	-7	6	9	5	-9	23
2	-6	2	4	-15	-15	8	1	-2	5	6	-16	-5	1	0	3	-3	25	24	18	-11	0	43	-10	21	24
-3	1	9	-2	-0	-6	5	1	-5	-4	-1	-5	-5	-0	-0	1	-8	7	-7	-2	5	-2	9	-0	-4	25
-5	-1	-2	-3	1	-2	3	-0	1	-1	9	-6	4	-2	0	-0	2	-3	-2	10	-4	-6	2	7	-8	26
6	-0	-26	7	2	10	-5	-1	4	14	-12	6	1	-2	-1	5	11	-6	3	-9	-7	3	-13	-2	28	27
4	-1	-19	7	-2	6	-9	-0	-1	4	-11	17	[illegible]	4	6	1	9	-3	16	-13	-1	4	-9	-10	-0	28
11	-3	8	2	-3	1	-2	-4	-0	-4	1	26	0	-3	-4	2	-5	-6	5	9	-3	3	20	-11	-6	29
10	-9	9	1	-8	-1	0	-4	20	4	16	-8	-10	7	-2	-4	-8	-4	33	14	-1	9	8	-12	1	30
-20	12	-19	-1	2	-1	1	3	2	2	-4	-3	-4	5	-1	0	-4	4	3	0	3	9	4	3	-6	31
-2	0	11	-1	-6	-1	2	2	-1	3	5	-6	0	3	1	0	-5	4	1	-1	-0	-2	-2	-8	-2	32
23	-7	36	-2	-1	-1	-2	1	-1	2	3	-2	1	-7	-1	-0	9	-11	0	-1	-4	2	8	-7	-5	33
3	-6	26	-1	1	4	-3	-3	-1	2	-6	4	-5	-5	-1	-2	5	-7	-5	-6	-4	-2	-1	4	9	34
1	3	-25	18	-4	8	-6	-1	1	-8	4	10	-3	2	18	-1	-11	11	-6	-3	2	1	-4	12	19	35
126	-15	-2	2	-1	3	5	3	-4	1	9	-8	-1	4	2	-0	-1	6	-1	-7	-1	3	-8	1	2	36
78	60	0	-4	19	-16	3	-4	-8	6	-10	3	-6	-10	1	3	-6	-9	6	-6	-12	0	16	-1	-5	37
62	-3	-21	-9	3	-7	13	-5	16	0	-9	-4	-2	24	-0	-1	3	3	-5	-14	-10	8	-1	48	4	38
61	33	10	6	-18	17	-5	-7	14	-2	-5	8	9	-3	-1	2	-9	-0	-3	29	13	-5	14	-28	-19	39
53	-10	42	-5	-14	4	-4	13	-7	-10	7	20	12	-3	-2	-0	-2	-15	-5	27	11	-8	28	1	-9	40
46	-4	-12	-6	1	-7	5	-9	-6	-0	3	2	6	-5	-2	1	-11	4	12	6	25	-3	-10	1	13	41
-6	131	-8	1	-3	-3	-1	-0	6	-4	9	-1	-4	-2	-4	0	-2	-12	-0	-15	5	-4	6	-1	4	42
2	114	6	-6	8	-6	-3	3	-5	-7	3	5	-0	7	4	-0	-8	-8	3	1	-12	1	11	-4	-3	43
4	102	4	5	-4	9	-2	1	-2	4	-15	-2	4	-3	-1	-1	15	19	-10	19	4	1	-20	3	3	44
1	74	8	16	-9	21	1	-5	11	-4	-9	-1	-1	-7	-6	0	-1	2	2	-14	17	3	-10	-8	5	45
4	40	-12	-1	-12	12	-5	7	-0	19	10	7	2	5	-0	-1	12	1	-15	26	-6	-3	-6	4	11	46
9	37	22	-1	3	-9	-1	3	-0	7	15	-14	-2	5	-1	-1	25	-6	7	34	-4	-3	-14	-6	0	47
14	1	91	9	3	21	5	1	-0	-6	-5	4	2	6	4	-3	-2	1	-10	-7	-4	7	-6	-25	3	48
22	-11	67	-4	17	-14	-1	-3	-2	1	1	5	-3	-15	-2	2	19	-13	2	2	-8	-12	-5	19	1	49
11	17	59	-6	4	-2	-6	-7	9	6	5	-20	-4	-1	2	-4	-21	26	29	-5	23	19	2	17	-9	50
17	8	49	-1	3	6	-8	-2	-3	1	-14	10	-1	3	2	-0	-5	17	11	-28	-8	18	-18	26	9	51
5	1	1	111	-10	-11	9	3	-3	5	4	4	4	-8	3	2	3	-6	12	1	-8	5	4	-1	-7	52
7	0	16	98	-15	12	2	4	4	5	2	-12	4	7	-0	-4	5	8	-1	-15	-2	3	-9	-23	2	53
6	3	-10	88	2	1	-4	1	6	-5	14	-2	2	-6	0	-1	-10	-0	-10	5	5	-6	10	24	-3	54
-7	5	4	81	19	-17	13	2	1	-4	-9	13	-4	-11	-2	4	12	-11	8	3	-10	-0	1	16	-6	55
17	[illegible]	[illegible]	79	43	18	-17	-2	-4	-6	0	8	-3	12	-3	-1	-14	11	-16	-5	3	10	8	-8	3	56
15	[illegible]	[illegible]	1	100	-9	-7	-0	5	-5	-9	1	9	7	3	0	6	6	-11	6	-2	0	-5	-15	15	57
16	[illegible]	-3	96	2	-1	-0	0	4	-7	6	-13	3	-5	4	8	-9	22	16	2	-10	5	2	-24		58
-5	9	30	8	35	6	-1	1	4	-10	5	20	5	4	1	1	22	17	3	2	11	15	6	2	0	59

24) Non-directed activities
25) Reading to the class — 24 .11 25

26) Encouraging improvement — 26

27) Textbook supplements — 27

28) Organizing class time
29) Reporting — 28 .10 29

30) Students' interests — 30

31) Sequencing orithmetic — 31

32) Displaying student models — 32

Probabilities of Latent Category Cor

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	54																							
2	02	54																						
3	00	29	45																					
4	-01	-00	02	62																				
5	-00	-00	01	25	57																			
6	03	00	01	10	08	25																		
7	00	-00	-00	02	02	03	62																	
8	01	02	-01	02	01	02	15	34																
9	04	02	-02	00	01	01	-01	10	38															
10	01	07	05	-02	-01	01	19	12	07	32														
11	01	03	04	01	02	01	01	04	04	05	50													
12	07	06	05	-00	-01	01	03	03	03	08	13	34												
13	09	02	02	01	01	02	00	01	05	07	02	11	36											
14	04	02	02	-01	-00	00	-01	01	02	02	07	08	18	62										
15	00	00	01	01	01	01	02	09	00	04	02	00	01	01	54									
16	-01	00	-01	03	04	02	03	09	06	05	03	-01	02	-01	14	53								
17	01	01	06	03	02	04	01	-01	03	03	01	03	04	01	-01	04	52							
18	04	03	02	-01	-01	01	-00	00	02	02	08	07	09	08	01	00	12	36						
19	02	-02	03	03	02	05	07	04	01	04	-01	02	03	05	01	00	17	07	37					
20	02	00	00	01	02	02	06	04	01	04	-00	06	06	04	03	03	01	00	02	36				
21	06	06	02	01	00	01	00	07	05	05	05	09	03	03	00	09	03	03	00	01	48			
22	00	01	02	02	02	02	00	-00	01	00	01	02	01	-00	-01	00	06	01	04	00	00	49		
23	03	09	07	-00	01	02	-00	-00	00	02	01	00	03	01	00	-01	06	01	-01	01	03	00	73	
24	01	05	04	04	01	02	06	05	08	06	03	02	-00	02	02	01	03	02	05	01	01	02	02	34
25	01	05	04	00	02	-00	-04	-00	08	05	02	03	02	-01	-01	03	07	04	03	01	02	01	04	11
26	02	01	02	04	04	04	-01	-00	02	02	01	03	08	08	01	03	07	03	03	05	02	01	04	02
27	04	04	05	-01	-01	00	01	03	05	05	04	05	02	01	02	03	01	01	-01	00	03	01	02	04
28	-01	-04	01	06	03	03	03	06	05	05	08	03	01	-01	08	06	02	00	04	01	00	08	-04	07
29	03	02	02	02	01	02	02	01	05	07	-01	05	06	01	-01	02	04	04	03	02	00	03	01	05
30	01	01	00	03	04	02	07	05	-00	06	-01	01	-00	-00	01	03	07	00	03	04	00	00	05	08
31	01	03	04	-02	00	-00	04	05	02	06	07	03	03	02	02	05	04	04	02	03	05	01	02	02
32	03	07	03	02	05	03	01	01	01	04	02	03	02	-01	01	03	06	00	-01	07	03	01	07	01

Confusions

4	25	26	27	28	29	30	31	32
34								
11	42							
2	05	22						
4	07	03	19					
7	02	03	04	50				
5	08	03	05	10	35			
9	06	04	02	02	03	31		
2	02	02	03	05	02	01	25	
1			03	01	05	07	00	25

	44	-3	7	-18	0	0	3	3	4	102	4	5	
	45	7	-13	20	-5	6	5	3	1	74	8	16	-1
	46	-0	5	-11	0	-1	1	6	4	40	-12	-1	-1
9	47	-4	-12	14	0	2	3	-11	9	37	22	-1	
	48	0	-14	17	3	2	4	-2	-14	1	91	9	
	49	2	-10	3	2	1	-3	50	22	-11	67	-4	1
	50	-2	12	-24	9	1	5	-11	-11	17	59	-6	
10	51	5	-8	15	0	-3	5	-8	17	8	49	-1	
	52	-0	-0	-5	-1	-3	-2	-1	-5	1	1	111	-1
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		4	-5	15	-1	3	3	-7	12	2	-14	50	-5	6	3	-2	-3	-53	-3	-9	22	20	11	62	128
		10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	

c. COMMENTS ON THE SUBSTANCE AND STRUCTURE OF THE LATENT CATEGORIES

The scientific meaning and utility of the LPA results are discussed in this section. First a perspective is given for the latent categories and for the kind of knowledge they represent. Second, the intrinsic value of this knowledge is discussed and its substance is outlined. Third, suggestions are made for methodological application and refinement of the results.

Reduction and Organization of the Interviews

The source of the information in the latent categories was the original series of teacher interviews. It would be possible, at great expense, for a researcher to listen to the tape recordings of all the interviews. Of course, the perceptual organization he would make of the interviews would be biased according to his particular research outlook. The LPA results presented in the last section are the culmination of an elaborate sequence of procedures--judging, blocking, sorting, LPA--designed to reduce and organize the interview information. Furthermore, the procedures were designed to yield a form of information which was reduced and organized according to the viewpoints of teachers. That is, these procedures produced a teacher-oriented summary of the interviews. The 128 content units may be considered, in scientific perspective, a sample of the interview statements. The interaction between the sampling stages and the content and structure of the latent categories is important and should be explained.

The sampling stages employed to obtain the final 128 items are diagramed in Figure 12.3. At the top of the diagram is illustrated the population of all possible reports that teachers might make of their actions and beliefs. The first stage in sampling was defining an interview format and selecting interviewees (explained in Chapter 5), and the resulting Sample 1 is the set of statements actually made and recorded in the interviews. The second stage was judging and blocking (also explained in Chapter 5), in which teachers listened to the tape recordings of the interviews, determined boundaries, and extracted content units from what was said. The resulting pool of content units is shown in the diagram as Sample 2. The third stage in the sampling process involved drawing a stratified random sample of content units; four units were chosen at random from the content units of each interview. Sample 3 is the set of 128 content units used in the sorting experiment.

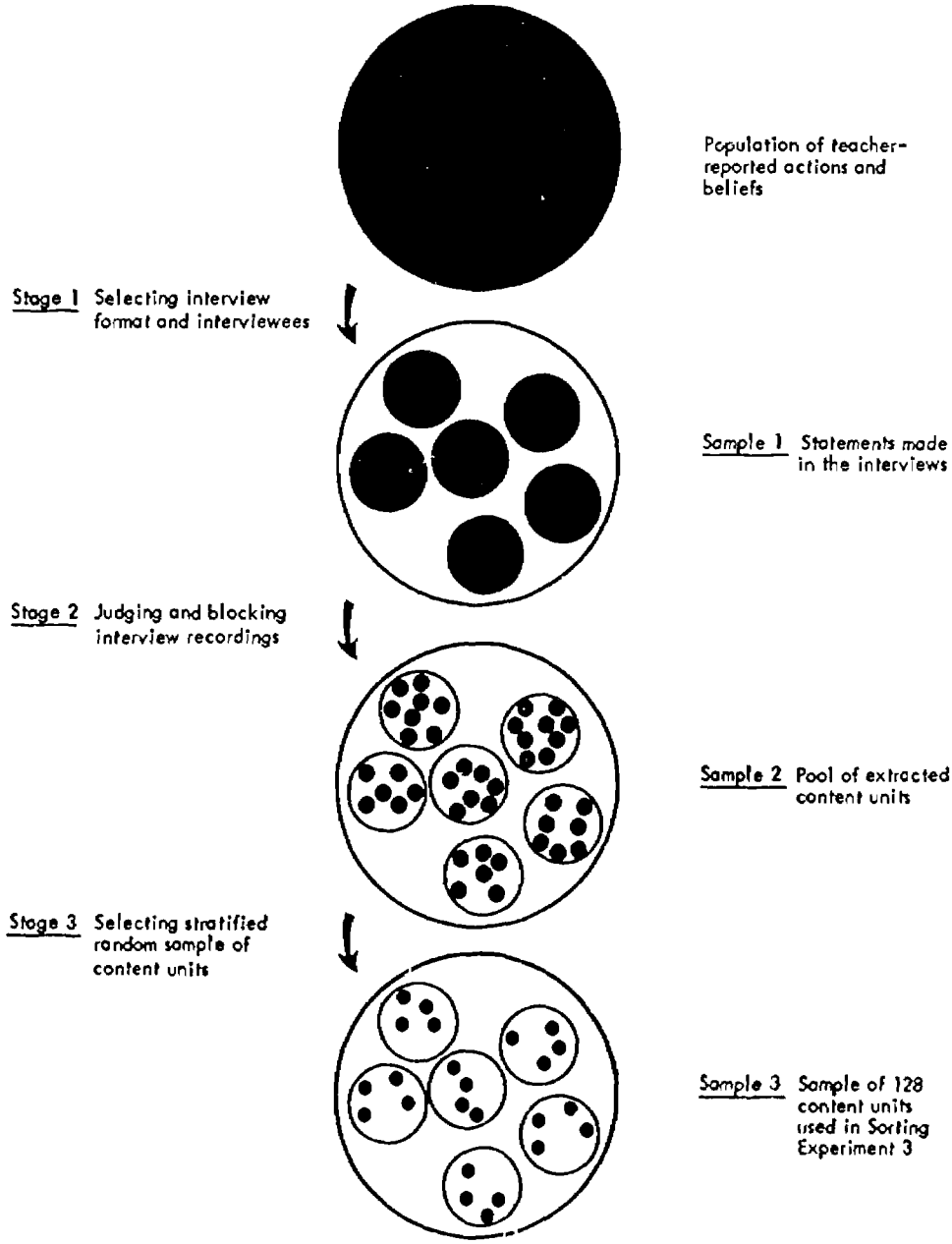


Figure 12.3 Sampling stages in deriving 128 content units for Sorting Experiment 3

In terms of the substantive content variation among the content units in the final sample, there was interaction between Sampling, Stage I and the substance of the derived latent categories. The interviews were designed to insure that each teacher could exhaustively contribute his views, and the selection of interviewees was designed to insure a wide range of teacher experience and background. Thus a variety of recorded actions and beliefs was obtained; that variety was preserved in Sampling, Stage 3, for the content units were selected systematically to represent all the interviews.

Sampling, Stage 2 was implemented so that each content unit would describe, according to the viewpoints of teachers, a single action or belief. That is, teachers were used as judges and blockers to insure that content units would not be ambiguous for other teachers. The LPA results reveal that most content units are unambiguous; the sorter did agree on the dominant ideas of most of the items. But some of the 128 items are exposed by the LPA results to be ambiguous; the sorters perceived various categories in them. Recall that in the latent partition model, sorter variation is indicated in two ways. One indication is content units which have several substantial loadings in Phi. In this case each sorter is presumed to have perceived several major ideas in the content unit and to have chosen (probabilistically) one of those ideas for the purpose of assigning the content unit to a category. The other indicator of sorter variation is in the confusion probabilities of Omega. It is assumed that each sorter has certain probabilities of uniformly merging the items of two latent categories. It is significant that most of the ambiguous content units in this set are ambiguous over latent categories which have high confusion probabilities though, mathematically, ambiguity and confusion are independent. The tentative explanation proposed for this unanticipated phenomenon is that the perceptions of teachers who construct the content units were based on the same latent categories and confusion patterns as the sorters. When two ideas were adjacent on the tape, they may have been contained in two latent categories with a high confusion probability and the judging or blocking teacher might not have separated them. Thus an item, ambiguous across confused categories, was created and entered into the pool.

Understanding the Latent Categories

The latent partition is a summarization of teachers' reports of actions and beliefs--a summarization of teacher viewpoints. It provides an understanding of how and what teachers perceive; that is, the LPA results presented in the previous section can be meaningfully read, and reading them is educative. The substance and structure which they teach is, of course, a function of the design and execution of the experimental procedures from the interview protocols to the LPA computations. The results are empirical, and all scientific effort has been directed toward making the results substantively realistic, relevant reflections of

teacher viewpoints, undisturbed by prior substantive hypothesizing by the researchers. The LPA results are substantively important and should be read carefully.

Three important points should govern interpretations of the latent categories and their interrelations:

One: Of the 32 latent categories, 22 are contained in the chains of more probable confusions and 10 are isolated. The isolated categories each contain a central idea which is strictly defined. Each chain represents a supercategory of ideas which are more subjectively differentiated and associated.

Two: About one-third of the catetories deal with particular subject areas. Several categories deal with personal relations with students, concern for their feelings, and consideration of their personality development. Several categories deal with specific teaching techniques. Several involve teaching materials. Several involve general teaching organization, approach, and attitude.

Three: While some of the subject-oriented categories are isolated, others are confused (merged) with more general aspects of the learning process. For example, "Spelling" is linked to "Drill", but "Sequencing Arithmetic" is isolated. That is, some but not all teaching techniques tend to be associated with particular subject-matter areas.

These three points are intended only to suggest a starting point for studying for substantive the substance of the latent categories and for developing specific substantive hypotheses which might suggest more specialized examination of the LPA results.

Methodological Considerations and Applications

The intrinsic utility of the latent partition for substantive study has been discussed. The partition also has utility as a methodological tool for further research applications. One of these, developing an inventory of teaching and learning situations, is discussed in Chapter 9. In sampling from the 128 content units for constructing an inventory, or in grouping them for constructing a scale, the latent partition provides a stratification framework. Each latent category comprises a set of content units which teachers perceive as concerning the same aspect of teaching and learning. Tests on particular criterion dimensions of teacher attitudes or characteristics then, might be reasonably made within a latent category (for a scale) or manipulated across latent categories (for an inventory). But such applications raise questions of the accuracy and validity of the LPA results and of the measurement problems implicit in them.

The mathematics of latent partition analysis are not so sufficiently advanced to provide direct statistical measurements of stability. However, in the present study, there are two internal indications of stability. First a crude reliability check was employed in the sorting procedure. The sorters received the 128 content units in 20 packets; for each sorter, one of the packets, chosen at random, contained a duplicate slip when it was encountered for the second time and pointed out the duplication to the researchers. Only three of the 32 sorters put the duplicate slip in separate categories. This indicates that the sorters were alert to individual content units and to their category assignments. The second internal indication of stability lies in the distribution of statements among latent categories. Most of the latent categories contain content units from each of several interviews. This indicates that the sampling did produce variation among content units.

Because of the difficulties of obtaining rigorous tests of validity and stability, replication of some or all of the procedures must be considered. It would be possible, but expensive, to replicate the procedures. For two reasons, this is probably not necessary, or at least it should not be given priority. First the substantive variation across latent categories is probably adequate indication that the sample of content units is large enough, and perhaps it would be wasteful to draw a new sample of content units. Second, the tentative statement may be made that, to determine latent categories which are sufficient representations of teachers' frameworks, the present sample of 32 sorters was designed to have high variance; the teachers systematically represented varied backgrounds and experiences. As explained in Chapter 8, if several different latent partitions are represented in one sample of sorters, then the LPA computations yield a set of categories which is a refinement of these latent partitions. So the latent categories computed on the basis of the manifest partitions of the 32 teachers sampled are representations of each of the manifest categorizations. Since the teachers presumably represent extremes of viewpoints, the latent categories are sufficient representations of categories of most teachers. To determine a set of refined categories, the samples of 32 sorters is very efficient. However, to accurately determine the level, rather than the pattern, of entries in Omega, the sample should be enlarged and proportionally weighted.

CHAPTER 13

RELATIONSHIPS BETWEEN SORTING BEHAVIORS AND SELECTED TEACHER CHARACTERISTICS

In Chapter 8, four studies were described which had the purpose of relating the LPA evidences of individual teacher differences with other teacher characteristics and of investigating some of the features of sorting behavior. In this chapter, the detailed specification, the results, and the interpretations of those studies are presented. The first study involved certain extended computations on the data from Sorting Experiment 3, results of which are presented in Chapter 12. The other three studies were based on the verb sort procedures described in Chapter 8. They concern, in order: teacher and professional characteristics and basic cognitive style; change in perception across time; and the perceptual structures of teachers operating under different organizational conditions. Two types of sorting behavior measures, defined in Chapter 9, are used. The first involves the sizes of categories that a sorter constructs; the second involves the substance of the categories that a sorter forms, as measured by the prototypic discordance score or by differential averaging of the confusion probabilities. Interpretation of the results are brief and are considered tentative, for the studies were intended to suggest substantive hypotheses which could be explored in later experimentation rather than to establish substantive theory.

a. EXTENDED COMPUTATIONS ON THE DATA FROM SORTING EXPERIMENT 3

As explained earlier, the 33 sorters in Sorting Experiment 3 were selected according to the stratified sampling scheme described in Chapter 5. Two of the factors involved in the stratification were grade-level taught (1-3 versus 4-8) and number of years of teaching experience (1-11 versus 12+). In the sample, both of these dichotomous factors yielded 50-50 splits, and there was no interaction: the cross-tabulation of the factors is presented at the top of Table 13.1. The LPA results for Sorting Experiment 3 appear in Chapter 12; there are 32 latent categories and 15 confusion probabilities greater than 10. By the method described in Chapter 8, a separate confusion matrix was calculated for each of the marginal subgroups.

TABLE 13.1

ANALYSIS OF SEPARATE CONFUSION PROBABILITIES

A. Classification of the Sorters

Years of teaching experience	Grade level taught: 1-3	4-8	
1-11	10	7	17
12+	7	9	16
	17	16	33

B. Estimates of the More Probable Confusions within the Marginal Subsamples[o]

Latent Category Pair	All 33 Teachers	Grade Level: Grades 4-8 (n = 16)	Grade Level: Grades 1-3 (n = 17)	Experience: 12+ Years (n = 16)	Experience: 1-11 Years (n = 17)
2-3	29	25	34	29	29
4-5	25	20	31	28	23
7-10	19	16	22	20	17
13-14	18	13	22	18	17
17-19	17	--	25	11	20
7-8	15	10	21	13	16
15-16	14	13	13	13	14
11-12	13	12	14	12	14
17-18	12	--	15	17	--
8-10	12	--	14	--	14
24-25	11	14	--	11	11
12-13	11	--	13	12	10
8-9	10	--	15	--	12
4-6	10	10	--	11	--
28-29	10	12	--	--	15

[o] The confusion probabilities estimated for each subsample correspond to the confusion probabilities of the total sample which were greater than 10. Where a confusion probability for a subsample is less than 10, "--" is written in the table.

The 15 entries--corresponding to the 15 entries in the total group confusion matrix which were greater than 10 --were extracted for the four subgroups and are presented at the bottom of Table 13.1. As mentioned in Chapter 8, the sample sizes (16 and 17) are small and are therefore considered as suggestive rather than definitive.

Several comments should be made concerning the substance of the results. First, it is apparent that the confusion probabilities for primary teachers are systematically higher than for intermediate teachers. One explanation would be that the fine distinctions made between some of the latent categories are less relevant with respect to teaching younger children. For example, the distinction between Category 13, Structure of Language, and Category 14, Correct English Usage, is relevant only when students begin formally to learn grammar. Second, it is apparent that the relationships between the confusion probabilities of teachers with high and low experience is more complex; some probabilities are larger for high experience, some for low experiences. There is, in summary, a difference in the pattern as but not in the level of confusion probabilities. It is not known how much of this variation is due to the idiosyncracies of teachers in this particular sample.

b. RESULTS OF VERB SORT EXPERIMENTS

Specification and Results of Verb Sort 1

The objective of this study was to examine relationships within a sample of experienced teachers among three classes of variables: (1) personal and professional characteristics of teachers; (2) cognitive style characteristics of teachers; and (3) measures of sorting behavior.

Subjects. The 69 sorters were experienced teachers from school districts near Madison, Wisconsin. Their average age was 38.8; 11 of them were males; 17 were secondary level teachers.

Administration. The experiment was administered in two groups at semi-rural schools; the occasions were teacher inservice meetings scheduled for research participation. The tasks were, in order: Hidden Figures Test, 15 minute limit (Jackson, et al., 1964); Category Width Scale, 15 minute limit (Pettigrew, 1958); and Verb Sort, which had no limit. The teachers completed the sorting in 15-40 minutes.

Variables. There were ten variables in all; they are listed in Table 13.2 along with their means and standard deviations. Variables 1 through 4 and variable 10 are measures of sorting behavior. Variables 5, 6, and 7 concern three personal and professional characteristics. Variables 8 and 9 are standardized measures of cognitive style.

Analysis and results. The intercorrelation matrix of the variables was calculated; it is presented in Table 13.3. In order to clarify the relationships implicit in the correlation matrix, a principal component analysis (Hotelling, 1933) was performed. There were four eigenvalues greater than 1.0 and the corresponding factors were rotated according to the normal varimax orthogonal procedure (Kaiser, 1958). The factor matrix is presented in Table 13.4.

Conclusions. The first two factors concern sorting behaviors, and they are essentially unrelated to the second two factors which concern personal and professional characteristics and cognitive styles. The first factor indicates that mean and standard deviation of category size are both positively related to prototypic discordance. The second factor indicates that standard deviations, skewness, and kurtosis of category size are positively related. The third factor indicates that age is related to sex (in this sample, the older teachers are women) and both age and sex are negatively related to the score on the Hidden Figures Test: older women teachers do less well on the test. The fourth factor indicates that elementary teachers (who are mostly women) tend to have higher Category Width Scale Scores. In summary, the conclusion is that sorting behavior, as measured by prototypic discordance and measures of category size, is not related to the personal and professional characteristics or to the cognitive style characteristics. The latter two classes, however, are interrelated.

LPA analysis and results. The LPA computational procedures were applied to the 69 categorizations. The estimated number of latent categories was nine. Tables 13.5 and 13.6 are presented the resulting Phi and Omega matrices. In Figure 13.1 is displayed an interpretation of the latent categories and schematic diagrams of the more probable confusions. The latent categories are titled with the highest loading verbs; they are rather straightforward. In this figure (as in Figures 13.2 and 13.3) there is a number adjacent to each of the double-headed arrows which connect two sets of verbs (latent categories); this number is the entry in Omega which corresponds to the estimate of the confusion between those two latent categories.

TABLE 13.2

VERB SORT 1: DEFINITIONS, MEANS, AND STANDARD DEVIATIONS OF THE VARIABLES

Variable	Mean	Standard Deviate
1. Mean Category Size	10.0	4.0
2. Standard Deviation of Category Size	4.4	2.6
3. Skewness of Category Size	.57	.64
4. Kurtosis of Category Size	2.1	.68
5. Age (in years)	38.8	13.4
6. Sex (coded 1 = male, 2 = female)	1.8	.43
7. Grade Level (coded 1 = elementary, 2 secondary)	1.2	.43
8. Category Width Scale	6.4	3.7
9. Hidden Figures Test	65.6	18.2
10. Prototypic Discordance	187.8	73.4

TABLE 13.3

VERB SORT 1: INTERCORRELATIONS OF VARIABLES

Variables	1	2	3	4	5	6	7	8	9	10
1	100	14	-16	-50	-04	-04	01	-11	-07	74
2		100	44	16	-05	-22	26	06	11	61
3			100	82	11	07	18	-07	08	14
4				100	11	07	14	-01	10	-20
5					100	38	-09	-28	-08	-17
6						100	-30	-09	-16	-17
7							100	15	32	14
8								100	02	-13
9									100	17
10										100

TABLE 13.4

VERB SORT 1: VARIMAX PRINCIPAL COMPONENT FACTOR STRUCTURE

	FACTOR			
Variable	1	2	3	4
1	81	-37	08	-08
2	65	52	-20	14
3	12	93	10	05
4	-29	89	08	09
5	-02	12	78	-08
6	-19	07	55	-44
7	11	18	-20	69
8	-14	05	-71	-07
9	-02	01	09	85
10	95	03	07	15
SS	216	213	152	146

TABLE 13.5

VERB SORT 1: LATENT CATEGORY MATRIX (PHI)

	LATENT CATEGORIES								
Verbs	1	2	3	4	5	6	7	8	9
Illustrates	126	11	-1	12	-8	-7	-24	-19	5
Demonstrates	118	2	-2	16	-6	-2	-34	2	11
Lectures	93	22	-0	-4	-8	2	-26	-26	40
Introduces	91	8	3	-7	21	-11	7	-10	5
Displays	91	9	6	14	4	4	-18	-7	-6
Explains	90	-20	-6	-11	-10	-1	30	23	11
Simplifies	87	-17	-9	-1	-2	12	37	19	-27
Clarifies	83	-19	-11	-17	1	0	62	21	-22
Interprets	72	-16	21	-13	10	-20	53	20	-32
Discusses	63	4	-1	-20	4	29	22	-14	17
Exemplifies	49	-2	1	30	2	17	15	-2	-18
Penalizes	8	90	7	2	-5	1	-12	15	-7
Demands	2	88	6	-11	-1	-4	44	-23	3
Impels	-1	86	4	-1	8	2	31	-24	-10
Threatens	1	83	0	-1	-5	9	-14	24	3
Reprimands	2	71	-1	3	-3	11	-23	48	-7
Grades	-3	8	111	8	3	3	-20	-7	-3
Evaluates	2	-8	108	-11	-4	-16	13	3	16
Tests	-4	12	105	5	4	16	-19	-20	0
Judges	-2	-5	92	-2	-0	-22	29	22	-15
Answers	18	-17	41	-10	-2	34	38	14	-10
Inspires	23	3	-7	104	14	7	-26	-9	-10
Encourages	-11	-1	-7	94	-2	1	37	-16	3
Commends	-18	-12	14	92	-10	-2	-6	35	11
Stimulates	39	6	-10	77	10	-8	9	-12	-11
Rewards	-16	-13	25	68	-14	0	3	38	7
Organizes	2	2	-6	7	108	-5	2	-4	-6
Schedules	-14	-9	7	-1	99	7	2	14	-6
Arranges	3	2	3	-2	94	-2	8	-2	-1
Plans	1	1	-0	-1	92	-2	-14	-4	24
Drills	-3	6	-4	10	-1	124	-30	-3	-0
Repeats	-4	7	-8	-6	-3	120	3	-13	1
Reviews	8	-8	10	-7	4	92	11	4	-4
Reinforces	-21	-14	-11	5	3	71	51	29	-15
Questions	19	-2	34	-3	-5	52	8	-0	-4
Tutors	10	-19	4	-9	-9	46	9	18	36
Persuades	-7	30	-2	4	-5	-30	121	-26	15
Convinces	-18	4	-6	2	2	7	114	-9	5
Reasons	11	-18	3	-14	5	-9	98	29	-6
Urges	-13	31	-4	41	-6	-8	74	-32	19
Reminds	-21	9	-7	6	-1	19	73	-12	35
Confirms	-15	-14	4	11	10	33	65	23	-10
Controls	2	3	-5	-1	-10	-5	-17	110	21
Permits	-7	-1	-4	18	4	-3	-3	101	-2
Regulates	1	-5	2	-5	14	-13	2	95	12
Enforces	-5	38	-7	-9	1	10	12	68	-6
Restricts	4	53	-10	-9	10	1	-3	64	-12
Supervises	15	-10	2	-6	-0	-20	2	35	82
Advises	-10	-8	-2	6	-4	-1	39	1	77
Assigns	15	7	10	-5	26	35	-31	-12	58

TABLE 13.6

VERB SORT 1: CONFUSION MATRIX (OMEGA)

Category	1	2	3	4	5	6	7	8	9
1	62	-1	16	19	29	39	23	8	23
2		93	7	19	3	6	23	57	16
3			63	15	18	20	15	15	11
4				64	12	16	34	20	26
5					74	20	16	12	32
6						54	24	12	24
7							40	22	23
8								56	20
9									53

Specification and Results of Verb Sort 2

The objective of the second verb sorting study was to compare the sorting behaviors of a sample of teacher trainees by having them sort verb decks before and after a ten week practice teaching period.

Subjects. The 53 subjects were seniors in their last semester of teacher training.

Administration. The verb sorting experiment was administered in the University classroom before and after a conventional ten week practice teaching period, which was the trainees first experience in full-time teaching.

Variables. There were six variables constructed from the categorizations of each session. The definitions of the variables and their means and standard deviations are presented in Table 13.7. The first four variables for each session are the moments of category size; the other two variables are prototypic discordance measures. For each session, two prototypic discordance measures were computed: the first was based on the joint proportion matrix for the particular session; the second was based on the joint proportion matrix for the combined data (106 categorizations).

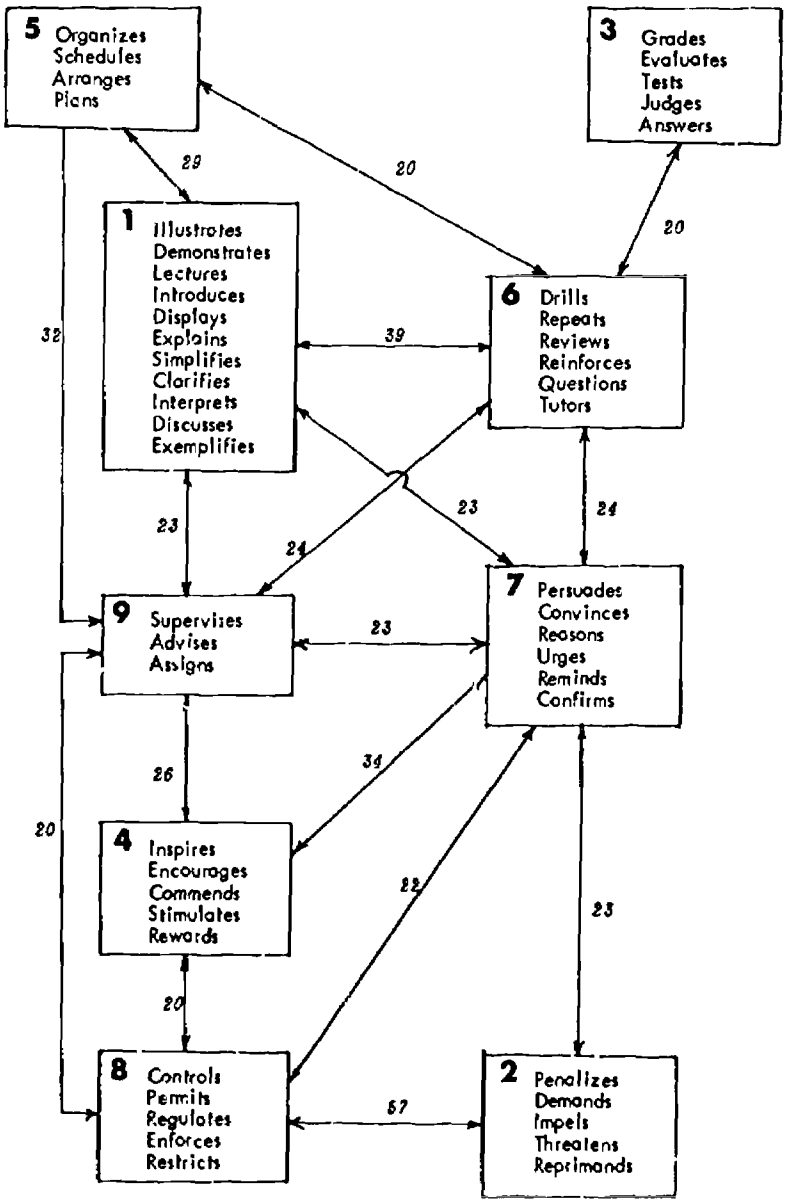


Figure 13.1 Verb Sort 1: Interpretation of the latent structure

TABLE 13.7

VERB SORT 2: CODES, MEANS, AND STANDARD DEVIATIONS OF THE VARIABLES

Variable	Number 1st session	Number 2nd session	Mean 1st session	Mean 2nd session	Standard Deviations 1st session	Standard Deviations 2nd session
Mean category size	1	7	6.3	7.5	2.0	2.8
Standard deviations of category size	2	8	3.0	3.6	1.4	2.2
Skewness of category size	3	9	.53	.48	.61	.68
Kurtosis of category size	4	10	2.6	2 5	.90	.67
Prototypic discordance measure based on the particular classes	5	11	115.7	136.8	44.1	63.5
Prototypic discordance measure based on the combined data	6	12	117.1	138.2	41.4	68.7

Statistical analysis and results. The intercorrelation matrix of the variables was calculated; it is presented in Table 13.8. In order to make clear the pattern of correlation, a principal components analysis (Hotelling, 1933) was performed; there were four eigenvalues greater than 1.0, and the corresponding factors were rotated according to the Harris-Kaiser (1964) independent cluster orthoblique procedure. The rotated factors are correlated. The factor pattern matrix and factor intercorrelation matrix are presented in Table 13.9. Clearly, factors 2 and 3 correspond to the first administration and factors 1 and 4 correspond to the second administration. In content, factors 1 and 2 are identical, only for different sessions: the high loadings are on mean and standard deviation of category size and the two prototypic discordance measures, which for this data are essentially equal. Factors 3 and 4 are also identical in content but for different sessions: the high loadings are for skewness and kurtosis of category size. From these measures then, two factors emerge for each sorting session. Across the two sessions, the corresponding factors have positive correlation ($r = .24$ and $.28$), as can be seen in the factor correlation matrix. In summary, there is evidence that individual sorting behaviors persist across time, even with intervening treatment.

TABLE 13.8

VERB SORT 2: INTERCORRELATIONS OF VARIABLES

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1	100	66	-13	-25	83	81	42	26	05	-05	32	33
2		100	36	03	90	88	22	17	07	15	20	20
3			100	64	17	17	03	26	22	15	22	22
4				100	-10	-10	02	28	24	03	19	19
5					100	100	32	19	04	10	29	29
6						100	31	18	03	10	28	28
7							100	66	-03	-30	86	87
8								100	41	-01	86	87
9									100	46	15	16
10										100	-11	-11
11											100	100
12												100

TABLE 13.9

VERB SORT 2: ORTHOBLIQUE PRINCIPAL COMPONENT FACTOR STRUCTURE

	Factor			
Variable	1	2	3	4
1	20	80	-32	01
2	-11	96	23	01
3	-03	19	92	00
4	08	-15	88	-03
5	01	99	01	00
6	-01	99	01	-00
7	90	08	-12	-22
8	91	-08	08	24
9	21	-09	02	86
10	-22	11	-06	85
11	97	00	04	-01
12	98	00	03	-00
	100			
	28	100		
	17	00	100	
	02	07	24	100

FACTOR PATTERNS

FACTOR INTERCORRELATIONS

LPA analysis and results. The LPA computational procedures were applied to the combined data (106 categorizations). The estimated number of latent categories was twelve. In Table 13.10 is presented the Phi matrix; in Table 13.11 is presented the Omega matrix; in Figure 13.2 is presented an interpretation of the latent categories and schematic diagrams of the more probable confusions.

Separate confusion matrices were calculated, by the method explained in Chapter 9, for the first and second session categorizations. In Table 13.12 is presented a comparison of the major confusion probabilities--those which for the combined data are greater than 19. It should be noted that the confusion probabilities for the second session are uniformly and systematically higher than those for the first session. After the practice teaching period, the trainees tended to merge their perceptions of the verbs, to confuse the latent categories. Further evidence of this is given by the difference in average mean category sizes for the two sessions: in the first session, the average mean category size was 6.3 verbs; in the second session, it was 7.5 verbs. Further designed experimental work is needed to attribute this general increase in confusion to the passage of time, the effect of teaching experience, or the repetition of the task. Compared with the results obtained for teachers, there was an excessive number of categories in the first session--the distinction being made are too fine, with respect to teacher means. The increase in confusion after the practice teaching indicates change toward the fineness of categorizations that experienced teachers manifest.

Specification and Results of Verb Sort 3

The objective of the third verb sorting experiment was to examine the evidence of sorting behavior differences between teachers and teacher interns working under different organizational conditions.

Subjects. Altogether, there were 342 sorters. They represented most of the elementary teachers and interns working in 21 associated school districts. The teachers and interns were divided according to whether they worked in a teaching team. The breakdown was as follows:

		Organizational Condition		
		Team	Non-team	
Type of sorter	Teacher	103	84	187
	Intern	98	57	155
	Total			342

TABLE 13.10

VERB SORT 2: LATENT CATEGORY MATRIX (PHI)

Verbs	LATENT CATEGORIES											
	1	2	3	4	5	6	7	8	9	10	11	12
Reviews	118	-5	-1	1	0	3	-4	-0	-2	5	-3	-7
Repeats	101	-5	-1	0	1	1	-4	-3	17	-3	-5	5
Drills	73	8	5	-5	-6	0	-0	-10	-32	-8	42	30
Reinforces	57	-5	-3	-9	3	3	29	1	49	7	-30	0
Reminds	51	0	-1	33	-1	-5	-1	22	8	0	-25	7
Threatens	-4	108	-0	-2	1	-2	4	-12	3	-0	2	2
Penalizes	-5	100	3	-11	-1	-2	5	1	5	1	1	1
Demands	0	91	0	18	3	-1	3	-7	-4	-6	7	-1
Reprimands	1	89	-0	-10	-2	-1	-2	24	2	3	-2	-4
Restricts	-2	88	-0	-7	-2	-0	-3	25	3	1	-1	-2
Impels	4	86	1	23	2	3	-1	-17	1	0	0	-2
Evaluates	-5	-1	109	0	1	3	-1	-3	9	2	-10	1
Grades	2	1	106	-4	1	1	-1	-2	-8	2	1	4
Tests	11	-1	102	-0	1	-0	-1	-0	-13	3	8	-9
Judges	-9	4	99	-1	-3	2	1	1	8	-5	-8	9
Convinces	-2	-0	-4	124	1	5	-3	-6	-3	-15	7	-0
Persuades	5	1	-0	120	1	2	-9	-4	-12	3	-7	1
Urges	-6	13	1	67	-1	-4	3	-9	-3	35	-18	21
Reasons	-0	-15	4	59	1	-3	11	23	31	-11	22	-24
Organizes	-1	1	-1	-1	104	1	-1	-0	8	1	-4	-3
Plans	0	1	3	-0	102	2	-2	-1	2	3	-5	-3
Schedules	0	-0	-2	1	100	-2	4	1	-4	-6	4	2
Arranges	0	-0	-0	4	94	-2	2	1	-4	-3	3	1
Demonstrates	1	-2	1	3	-2	98	1	3	-1	-3	4	-3
Illustrates	9	-3	2	6	-0	91	1	3	3	-4	4	-8
Displays	-5	2	2	0	2	88	5	-2	-10	2	2	4
Comments	-4	1	-3	-7	0	1	115	1	-5	6	1	-1
Rewards	1	3	2	-2	1	3	109	-8	-6	-9	-0	3
Regulates	-2	-4	-0	-7	7	2	-10	123	-7	-2	-2	6
Controls	-2	9	-2	-7	-6	1	-4	122	-6	-3	3	0
Permits	1	-13	-5	14	-5	2	22	84	-1	7	1	-10
Supervises	-20	-17	8	-6	9	-3	1	65	8	-2	1	59
Enforces	28	27	-3	6	-4	-3	-4	65	8	3	-9	-21
Clarifies	13	3	-4	-9	2	-5	-9	-7	120	0	-7	2
Simplifies	6	5	-4	-13	1	1	-10	-9	119	-1	-11	14
Interprets	-23	-5	30	8	3	-1	1	7	82	-6	18	-11
Explains	-22	1	-13	8	-3	1	-3	-7	90	-2	65	-2
Exemplifies	-3	3	2	-11	-2	45	-5	3	52	12	-20	15
Confirms	6	-4	0	12	2	-13	31	8	48	6	5	-1
Inspires	0	3	1	-11	-2	-5	-2	-5	1	119	4	-3
Stimulates	4	-3	0	-3	2	8	-7	2	-8	100	9	-5
Encourages	-4	-4	1	16	-3	-6	16	4	6	83	-18	10
Lectures	-9	11	-10	-10	-6	13	1	-6	-28	-1	111	34
Discusses	-2	-5	-12	8	-6	4	4	2	28	-1	89	-4
Introduces	-5	-1	-10	-8	16	12	-10	2	5	34	81	-13
Answers	1	-9	14	13	-5	-19	12	9	19	-12	78	-15
Questions	25	-7	31	10	-6	-14	2	11	-3	7	75	-36
Assigns	28	3	6	-11	24	-6	-5	2	-30	4	62	23
Tutors	20	4	1	-5	-6	-6	1	-12	10	-9	15	83
Advises	-23	-6	6	41	-1	-3	5	10	12	11	-8	60

TABLE 13.11

VERB SORT 2: CONFUSION MATRIX
(OMEGA)

	CATEGORIES											
	1	2	3	4	5	6	7	8	9	10	11	12
1	63	4	6	9	6	24	10	6	34	9	29	24
2		78	2	11	-0	2	11	35	2	3	2	1
3			76	4	9	1	12	6	7	2	13	2
4				57	2	8	24	14	15	37	10	20
5					86	9	2	12	7	6	15	15
6						93	7	4	38	18	36	12
7							57	16	12	29	6	14
8								48	8	9	5	11
9									54	17	34	16
10										68	13	18
11											47	16
12												46

Interns generally had B.S. degrees or were graduate students, and they had spent one semester as a full-time teacher. From analysis not presented here, it is known that the teachers and interns listed as "team" were indeed working under conditions in which operations were more jointly and cooperatively executed. The teams usually consisted of two interns and two teachers.

Administration. The verb sort task was administered to the sorters in a series of evaluation meetings held around the state of Wisconsin. Other instruments were also administered, and other subjects were present, but only the verb sort results for the 342 elementary teachers and interns is presented here.

LPA analysis and results The LPA calculations were applied to the 342 categorizations. The estimated number of latent categories was nine, but as explained in Chapter 9, the LPA resolution was carried out on the basis of 13 categories, in the hope of specifying fine differences between the subgroups. The Phi matrix derived is presented in Table 13.13, and the Omega matrix is mentioned in Table 13.14. An interpretation of the latent categories is presented in Figure 13.3 along with schematic representation

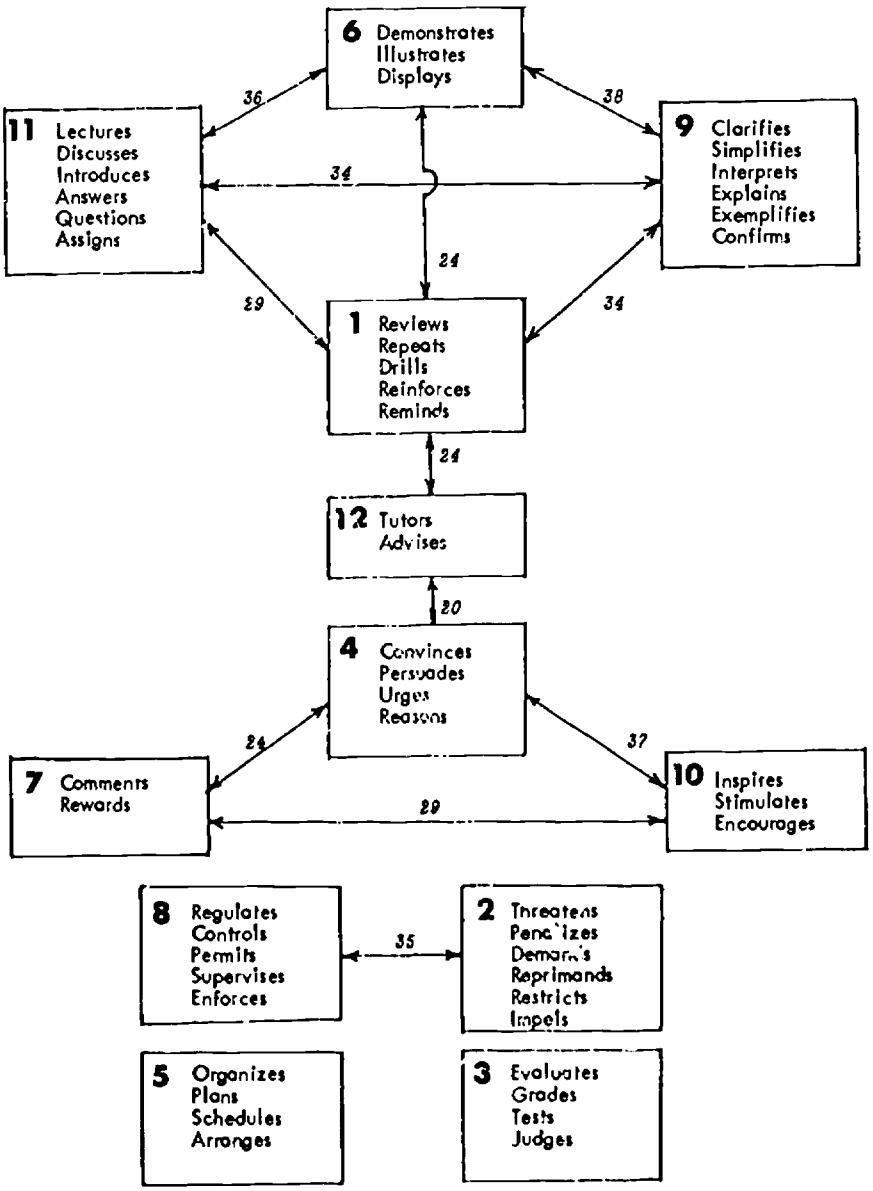


Figure 13.2 Verb Sort 2: Interpretation of the latent structure

TABLE 13.12

VERB SORT 2: SUBGROUP COMPARISON OF THE MORE PROBABLE CONFUSIONS

Latent category pair	Combined data (106 categorizations)	First session (53 categorizations)	Second session (53 categorizations)
1-6	24	19	30
1-9	34	29	39
1-11	29	24	34
1-12	24	24	25
2-8	35	32	37
4-7	24	20	28
4-10	37	31	42
4-12	20	15	24
6-9	38	36	41
6-11	36	32	39
7-10	29	26	33
9-11	34	29	39

of the more probable confusions. Because of the overdetermination of the number of latent categories, the confusion probabilities are systematically higher than those for Verb Sort 1 and 2.

Separate confusion matrices for the six important sub groups of the 342 sorters were determined. The 14 entries corresponding to the 14 entries in the total group confusion matrix which are greater than 29 were extracted from each of the subgroup confusion matrices and are presented in Table 13.15.

There appear to be no important differences between the confusion probabilities for teachers and interns as a whole, nor between team and non-team teachers. But non-team interns have uniformly and systematically higher confusion probabilities than team interns; they tend more to confuse or merge across latent categories. This parallels the result of Verb Sort 2

$$\frac{\text{before practice teaching}}{\text{after practice teaching}} = \frac{\text{team intern}}{\text{non-team intern}} .$$

TABLE 13.13

VERB SORT 3: LATENT CATEGORY MATRIX (PHI)

	LATENT CATEGORIES												
Verbs	1	2	3	4	5	6	7	8	9	10	11	12	13
Illustrates	100	-0	-0	-1	-2	4	-0	2	2	-4	4	-3	0
Displays	100	1	-1	6	7	4	-1	-8	3	1	-7	-4	-1
Demonstrates	94	-1	2	0	-4	-4	-0	3	5	-4	-1	15	-4
Threatens	1	120	2	-1	2	-1	-15	-1	-7	-1	1	-2	1
Penalizes	0	117	1	4	-0	-3	-12	2	-13	-0	-5	-0	11
Reprimands	2	106	3	-2	-0	-1	-0	-1	-10	-2	2	-7	10
Demands	-8	83	-9	1	1	2	8	5	26	-0	2	11	-20
Restricts	3	77	2	-1	-2	-2	34	-3	-3	-2	-0	1	-4
Impels	-7	70	-11	0	2	1	3	3	47	9	2	13	-31
Enforces	5	46	12	-2	-3	23	33	33	2	-3	-2	-5	-3
Rewards	-1	3	115	8	0	-2	3	3	-14	-2	-7	8	-16
Commends	2	-3	110	-6	1	-4	-4	-11	7	-3	3	2	7
Encourages	-5	-3	46	-6	1	-4	-11	0	25	44	5	-5	13
Grades	-3	-3	5	100	-0	1	2	0	3	-1	-3	8	-8
Tests	4	-2	-2	98	1	13	-1	-11	4	1	5	-1	
Evaluates	8	3	-2	89	1	-8	-6	5	-10	6	9	-15	21
Judges	-2	7	3	85	-4	-10	3	10	3	-2	-5	5	6
Plans	4	5	2	-0	106	2	-6	-6	-7	3	3	-5	2
Organizes	7	-0	-2	-1	101	1	-1	5	-0	-0	-0	-8	2
Schedules	-10	-2	-1	3	99	-1	2	-5	4	-3	1	11	1
Arranges	-1	-1	1	-2	94	-4	3	11	5	-5	1	-1	-2
Repeats	-4	-4	-9	-3	-2	110	1	26	1	2	-12	0	-6
Reviews	12	1	-4	4	4	108	-7	-11	-10	2	19	-12	-5
Drills	-4	-2	-10	2	-5	102	4	-28	5	-0	16	26	-8
Reinforces	4	2	32	-3	3	84	-8	13	-15	2	-6	-21	13
Reminds	-3	3	0	-1	-3	63	10	5	38	-7	-18	-8	21
Controls	2	0	5	-2	-5	-1	106	-3	-1	6	1	3	-5
Regulates	-4	-14	-7	2	4	-1	102	6	-0	6	-4	0	9
Clarifies	-5	0	-5	-5	-1	5	2	121	-9	5	1	-7	-0
Simplifies	1	8	-10	-3	4	11	-8	113	-8	6	-18	-5	9
Interprets	-7	-5	1	14	-0	-14	8	105	-0	-2	0	7	-9
Explains	14	-1	0	-5	-3	-11	3	97	-6	-2	-1	17	-1
Confirms	-15	-8	34	3	3	19	4	61	23	-14	-1	-7	-2
Exemplifies	35	-5	1	-3	2	6	9	46	16	8	-2	-8	-6
Reasons	2	4	-1	-4	3	-14	-6	43	35	-5	29	-13	25
Persuades	7	-5	-5	-0	0	-0	-2	-12	120	-3	0	-4	5
Convinces	4	-10	-7	2	1	-4	7	5	111	-4	-7	6	-6
Urges	-6	3	10	-2	-2	-3	-14	-10	89	13	4	6	12
Inspires	-5	-0	3	2	1	1	2	3	1	103	-0	-5	-5
Stimulates	1	-1	-9	1	-4	2	5	1	-3	103	-0	0	3
Questions	-2	-1	-4	4	1	6	0	-13	-2	1	116	-6	-4
Discusses	14	7	4	-18	-8	-11	-12	26	-16	1	62	22	30
Answers	-18	-7	5	8	-0	7	6	52	15	-13	55	10	-18
Lectures	9	1	11	-2	-11	-10	2	5	3	-6	-2	108	-8
Assigns	-18	-7	-4	3	24	14	8	-16	7	0	2	79	9
Introduces	23	1	-3	-5	17	-3	-1	1	-17	34	10	48	-3
Advises	-3	5	-6	0	-1	-8	-17	10	25	2	-5	-9	109
Supervises	1	-2	-8	4	6	-3	28	-12	-21	-2	4	4	104
Tutors	-8	6	0	5	-12	28	-18	7	-11	-3	-23	55	66
Permits	9	9	26	-9	-1	-4	32	-16	10	-4	20	-23	49

TABLE 13.14

VERB SORT 3: CONFUSION MATRIX (OMEGA)

	1	2	3	4	5	6	7	8	9	10	11	12	13
1	79	5	15	9	21	28	7	46	15	30	38	45	23
2		77	19	10	6	14	55	7	23	6	7	11	13
3			58	14	7	18	16	18	37	43	18	8	25
4				82	14	18	12	13	8	5	28	15	11
5					78	14	17	17	9	13	16	28	20
6						53	15	34	19	15	30	30	22
7							70	10	23	6	9	15	2
8								54	22	25	38	34	27
9									54	41	18	13	29
10										79	23	17	29
11											55	35	24
12												55	23
13													38

TABLE 13.15

VERB SORT 3: COMPARISON AMONG THE SUBGROUPS OF THE MORE PROBABLE CONFUSIONS

Latent Category Pair	All Sorters (N = 342)	Teachers (N = 187)	Interns (N = 155)	Team Teachers (N = 103)	Non-team Teachers (N = 84)	Team Interns (N = 98)	Non Interns (N = 57)
1-8	46	45	48	45	44	48	47
1-10	30	32	29	33	31	26	34
1-11	38	37	38	36	39	37	39
1-12	45	49	39	50	48	38	40
2-7	55	54	57	55	52	56	60
3-9	37	38	36	35	40	20	29
3-10	43	40	46	36	45	31	45
6-8	34	33	36	35	31	42	52
6-11	30	32	28	33	30	31	45
6-12	30	31	30	33	28	28	35
8-11	38	39	38	38	40	36	40
8-12	34	36	32	38	45	31	35
9-10	41	40	42	36	44	36	51
11-12	35	35	32	30	37	30	35

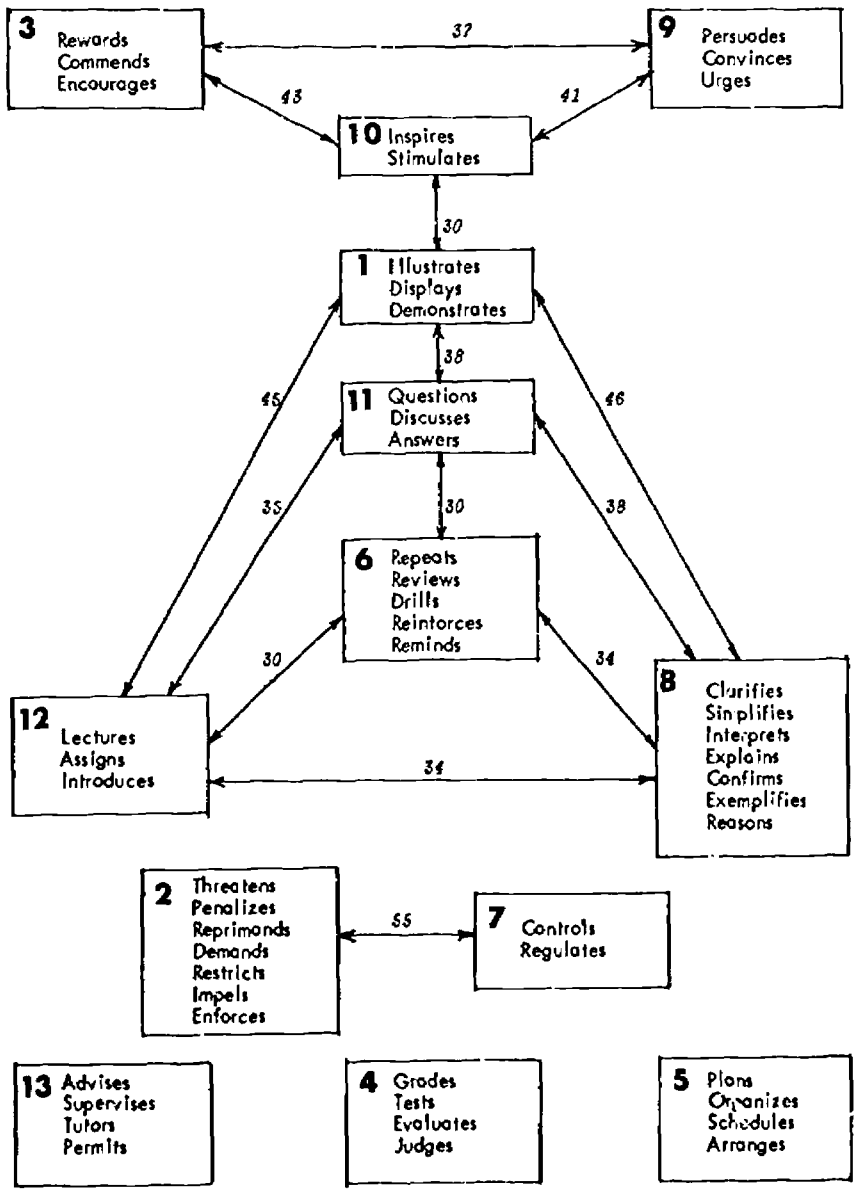


Figure 13.3 Verb Sort 3: Interpretation of the latent structure

CHAPTER 14

TEACHER RESPONSES TO A PRIORI DEFINITIONS OF SUBSTANCE AND STRUCTURE

Two instruments, the Inventory of Classroom Learning Situations (ICLS) and the Inventory of Teaching Practices and Learning Situations (ITPLS), were developed for investigating the logical manipulation of the substance and structure of teachers' views. The Instructional Cooperation Questionnaire (ICQ) was developed for measuring teacher cooperation in classroom situations. The results of studies using these instruments will be presented in this chapter.

The first section will report a factor analysis of the ICLS which consisted of items defined by manipulation of content units according to logically specified criteria. The second section will describe results obtained from an analysis of variance of the ITPLS constructed on the basis of a priori factor definitions of the inventory items. The third section will discuss the results of relating the ICQ with the ICLS and with other selected teacher variables.

a. ANALYSIS OF ICLS

Administration of the Inventory

On the basis of the stratification scheme developed for sampling teachers (Chapter 5), the ICLS was administered to 212 teachers in 32 school districts throughout the state of Wisconsin. For various reasons, 53 questionnaire protocols were not usable, and a total of 159 inventories were available for the analysis.

From an examination of the unusable inventories there appeared to be no systematic reason for their invalidation; inventories which were eliminated appeared to be randomly distributed throughout the sample. The assumption was made that the 159 usable inventories constituted a representative sampling of the population of elementary teachers in the state.

Analysis of the Items

The mean scale response for each item was computed to indicate whether the activity described was perceived by a majority of the respondents as facilitative of learning. This analysis indicated that a majority of the teachers felt that most of the activities described by the items tended to be facilitative of learning. In fact, 34.9% of all responses were on scale point six (Greatly Facilitates Learning) and

72% of all responses were on scale points four, five, and six; these scale points range from moderately to greatly facilitative of learning.

There was considerable variability, by item, in terms of teacher agreement with regard to the extent of learning facilitation attributable to the item content. One item was derived to greatly facilitate learning by 82% of the responding teachers:

> 22. When Mrs. Cooper learned through a class discussion that her pupils were unsure of the larger and smaller measures of fractional parts, she gave them squares, circles and rectangles of colored paper to use in illustrating the fractional measures.
>
> "Take the circle, fold it through the center, then cut on the fold. How many parts do you have? Again, fold each part through the center..."
>
> In this situation the practice of going back to concrete materials to illustrate fractional parts...

0	1	2	3	4	5	(6)
Does Not Facilitate Learning		Slightly Facilitates Learning		Moderately Facilitates Learning		Greatly Facilitates Learning

In contrast, teacher responses to another item were much more variable; 26.9% of the responding teachers marked zero and the same percentage marked six:

> 10. A left-handed writer, according to Mrs. Roberts, should do what is comfortable for him.
>
> "Be sure your pencil is slanted toward your right shoulder. Those of you who are left-handed, do what is most comfortable for you."
>
> In this situation the practice of allowing left-handed writers to do what is comfortable for them...

The phenomenon of the majority of teachers choosing even-numbered response scale points (zero, two, four, six) rather than odd points (one, three, five) has not been investigated; but it may be an artifact of even-numbered scale points having verbal anchors while odd-numbered scale points had no such labels.

Factor Analyses

The purpose of applying factor-analytic techniques at this stage of the project was to examine the structure of teacher viewpoints as recorded on paper-and-pencil instruments in scaled questionnaire format. Comparing this structure with that obtained from sorting methodology and Latent Partition Analysis would indicate important similarities and differences between the two techniques.

Contents of the questionnaire were adapted from the same content units that were used in an early sorting experiment and application of LPA (see Chapter 9). The main differences between the sorting task and the questionnaire were, of course, 1) response mode, or grouping items rather than reading and reacting to each one individually, and 2) set, or being careful not to make value distinctions, rather than purposely making such distinctions.

The question to be researched was: Will this questionnaire content, whose structure within the LPA paradigm is known, have similar structure when manipulated and analyzed in different and more conventional ways? To answer this question, the ICLS was designed and administered, and responses to it were analyzed with two types of multivariate factor analysis. The two schemes used to analyze teachers' responses to the inventory were image analysis and principal component analysis; for both schemes, varimax orthogonal rotations were employed.[1]

Results of these analyses are not reported in their entirety; they are presented here in a format intended to demonstrate the degree of overlap between structure of content represented by image and principal component factors and the content represented by latent categories from LPA.

Factor comparisons between image and principal component analyses. The twelve significantly large factors were taken from the rotated image factor matrix, and 13 such factors were taken from the rotated principal components factor matrix. The composition of each factor was investigated by listing all variables (ICLS items) which had loadings greater than .30 on the factor. The degree to which a particular image factor is similar to a particular component factor is reflected in the number of items which the two factors have in common.

[1] Definitive references for these techniques are: C. W. Harris (1962), "Some Rao-Guttman relationships," H. Hotelling (1933), "Analysis of a complex of variables into principal components," and H. F. Kaiser (1958), "The varimax criterion for analytic rotation in factor analysis."

Table 14.1 gives the ICLS item-contingency matrix for the results of the image and principal components analyses. Reading across a row in this table will indicate how many items loaded on the corresponding principal components factor and the diversity with which those items were distributed across image factors. Similarly, reading down a column will indicate how many items loaded on an image factor and the diversity with which they were distributed,in the other analysis, across image factors. Because this section is intended only to show the degree to which factors and categories overlap, actual factor compositions and substantive interpretations are not given here.[1]

Inspection of Table 14.1 indicates that there is considerable overlap in item composition between the two analyses. Although there is a slight tendency for items on the larger image factors to be spread across two or more principal components factors, there is a definite concentration of items in nine intersections of particular image factors with particular principal components factors.

Comparisons between factors and latent categories. An item-contingency matrix was prepared to illuminate the relationship between the contents of latent categories, from which ICLS items were adopted, and the contents of image factors. This matrix is presented in Table 14.2.

Examination of the frequencies of items common to latent categories and image factors indicated that there is very little content overlap between categories and factors. The items of any major image factor were derived from content units of several latent categories; and, generally, items based on content units from latent categories related diversely to image factors.

This relationship was also true of the comparison between latent category compositions and the compositions of principal component factors. The item contingency matrix for this comparison is given in Table 14.3.

Comparability of structure. There are a number of potential explanations of the lack of correspondence between LPA categories and factors from image and principal components analyses. One of the most likely reasons is, of course, the difference between the two statistical models. Factor analytic schemes have been designed to provide efficient and meaningful summaries of intercorrelations among continuous

---

1 The questionnaire and the complete factor matrices for ICLS are available on request. See Appendix I.

TABLE 14.1

COMPARISON OF ITEM COMPOSITIONS OF IMAGE FACTORS AND PRINCIPAL COMPONENTS FACTORS

Principal Components Factor	Image Factor												
	1	2	3	4	5	6	7	8	9	10	11	12	Total
1	5												5
2	1	6											7
3			3										3
4	1			4									5
5		1			3								5 [a]
6							3				1		4
7	1	1											4 [a]
8						2							2
9	1									3			4
10								1			1		3 [a]
11		1	1	1									4 [a]
12									2				3 [a]
13	1			1									3 [a]
Total	11 [a]	10 [a]	4	6	3	2	3	1	2	3	2	1 [a]	(b)

[a] Column or row total is not equal to the sum of the entries in the corresponding column or row because certain items had loadings greater than .30 on factors in one analysis but not on factors in the other analysis.

[b] The sum of column totals is not equal to the sum of row totals because certain items had more than one loading greater than .30 in the principal components analysis.

TABLE 14.2

COMPARISON OF ITEM COMPOSITIONS OF LATENT CATEGORIES AND IMAGE FACTORS

Latent Category	Image Factor 1	2	3	4	5	6	7	8	9	10	11	12	Total
1				1							1		3[a]
2		2				2			1				5
4	1		2										3
5	2	1			1					1			6[a]
6	3												3
7			1		1								3[a]
8		2		1	1								5[a]
9	2	2		1			1					1	9[a]
10	1			1									6[a]
11	1	1		1									4[a]
12							1						3[a]
13							1						3[a]
14		1									1		2
Total	10	9	4[b]	5	3	2	3	1[b]	2[b]	3[b]	2	1	(c)

[a] Row total is not equal to the sum of entries in the corresponding row because certain ICLS items loaded on more than one image factor.

[b] Column total is not equal to the sum of entries in Column 10 because one ICLS item was adapted from a significant loading on any latent category; this item loaded on image Factor 10.

[c] The sum of column totals is not equal to 50 because a few ICLS items had no significant loadings on any image factor. The sum of row totals exceeds 50 because of multiple factor loadings of some items.

TABLE 14.3

COMPARISON OF ITEM COMPOSITIONS OF LATENT CATEGORIES AND PRINCIPAL COMPONENTS FACTORS

Latent Category	Principal Components Factor 1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1				1		1	1			1				4
2								2				1		3
4			2											3[a]
5	2	1			2		1		1		1			8
6	2								1					3
7			1		1									3[a]
8		1			1						2			4
9	1	2		1		1	1			1			1	9[a]
10				1			1		1	1		1	1	6
11		1		1								1	1	4
12						1								3[a]
13						1								2[a]
14		1				1								2
Total	5	6	3	4	4	5	4	2	4[b]	3	4[b]	3	3	(c)

[a] Row total is not equal to the sum of entries in the corresponding row because certain ICLS items loaded on more than one principal components factor.

[b] Column total is not equal to the sum of entries in Column 9 because one ICLS item was adopted from a content unit which did not have a significant loading on any latent category; this item loaded on principal components Factor 9.

[c] The sum of row totals exceeds 50 because a few items had multiple factor loadings.

variables, while LPA has been designed to provide summaries of qualitative, non-scalar, and discrete distinctions.

Another possible reason for the disparity in structure is the psychological difference between the two tasks. A partition of a set of content units into categories is a function of the set; that is, placing a unit in a category occurs only after the sorter compares it with other units and considers a range of categories which might include it. For the purpose of preparing ICLS, only a few content units were taken from each of several latent categories. Respondents to ICLS could therefore make only a few of the many item comparisons which the sorters made in forming their manifest partitions. Indeed, a respondent could complete the ICLS without ever directly comparing any two items. A second important psychological difference between the tasks was the difference between the two sets of instructions in emphasis on evaluation. Sorters were instructed *not* to make categorical distinctions among content units according to whether the described practices represented "good" or "bad" teaching. Conversely, ICLS respondents were required to judge whether a practice described in an item did or did not facilitate student learning. Varying factor (or category) compositions might be expected under such varying conditions.

b. ANALYSIS OF ITPLS

Administration of ITPLS

The ITPLS was administered to two groups. Subjects for the first administration were 51 education students, most of whom had no previous teaching experience, but who were scheduled to begin student teaching the following semester. A second administration was conducted during an in-service meeting with 38 elementary school teachers who taught in a suburban district. Each was directed to respond to the items in terms of judgments he would make if he were the teacher described in the item. It was emphasized that there were no right or wrong responses.

Reliability Characteristics

The internal consistency of each factorially homogeneous set of items was measured by computing the Hoyt reliability coefficient for each of the 16 subsets of four items. The *a priori* weighting scheme defined by the seven-point response scale was used. The range of the reliabilities for the student group was .23 to .72, and the median was .57. For the group of teachers, the range was .14 to .73, with a median of .41. Since these reliabilities are based on four-item 'tests', satisfactory reliability levels for the 16 subsets

of items were obtained for both administrations of the inventory. When stepped up by the Spearman-Brown formula, the comparable median reliability of a 20-item test of this sort would be .87 for the first administration and .78 for the second.

The independence of the subsets was measured by intercorrelating the 16 groups of items. Scores for these correlations were obtained by summing an individual's responses over the four items of a subset. The range of subset intercorrelations for the first administration was .14 to .70, and the median was .37. For the second administration, the range was -.15 to .68, with a median of .27. The value of the median correlation coefficient for each administration was significant beyond the .005 and the .05 levels, for the first and second administrations respectively.

Analysis of Response Measures

The purpose of the statistical analysis was to evaluate the design factors of the inventory and not the characteristics of the respondents. It seemed, therefore, that the most appropriate response measure was the sum of an individual's responses over the four items of a subset. The design used in the analysis of variance, therefore, was a $2^4 \times N$ repeated measures design.[1] Results of the analyses for the two administrations are presented in Table 14.4.

Various main effects and interactions were significant ($p < .01$). As might be expected, large sources of variation due to individual differences were reflected in the significant main effect for persons and in first-order interactions with the other main effects. In both groups, the main effect, Teaching Method, accounted for the greatest proportion of variation among the manipulated factors--40% for the first administration and 51% for the second administration. Teacher Approach was significant as a main effect in the second administration, but accounted for only 2% of the total variation due to the factors. Six of the seven significant interactions were alike for both groups. The significant four-factor interaction, Grade Level by Subject Matter by Teacher Approach by Teaching Method, implies that each piece of information designed into the treatments (item types) affected the teachers differentially and systematically influenced response tendencies. The mean response values for each of the 16 treatment combinations are shown in Table 14.5, where they are rank-ordered.

[1] Results of the analysis of ITPLS appeared in the Spring, 1966 issue of the Journal of Educational Measurement, in an article by D. M. Miller and Marjorie V. Lutz. The tables and figures in this section are reproduced from that article with the permission of the editors.

TABLE 14.4

ANOVA SUMMARIES FOR ITPLS

Source	Error Term	First Administration df	First Administration Mean Square	First Administration % Var.[d]	Second Administration df	Second Administration Mean Square	Second Administration % Var.
P (persons)	(PGSTM)	50	103.8[c]		37	64.4[c]	
G (grade level)	(PG)	1	1.4		1	73.2	
S (subject matter)	(PS)	1	10.8		1	16.1	
T (teacher approach)	(PT)	1	71.8		1	231.3[c]	2
M (teaching method)	(PM)	1	5090.0[c]	40	1	4548.6[c]	51
P x G	(PGSTM)	50	22.6[c]		37	23.1[c]	
P x S	(PGSTM)	50	9.1[b]		37	11.4	
P x T	(PGSTM)	50	15.8[b]		37	13.3	
P x M	(PGSTM)	50	22.3[c]		37	15.0[a]	
G x S	(PGS)	1	447.1[c]	7	1	80.3[b]	2
G x T	(PGT)	1	38.0		1	1.0	
G x M	(PGM)	1	43.3		1	2.0	
S x T	(PST)	1	43.3[a]	1	1	35.5	
S x M	(PSM)	1	1223.5[c]	19	1	308.4[c]	7
T x M	(PTM)	1	31.4		1	95.5[c]	2
P x G x S	(PGSTM)	50	7.2		37	8.9	
P x G x T	(PGSTM)	50	8.9		37	5.2	
P x G x M	(PGSTM)	50	7.8		37	7.5	
P x S x T	(PGSTM)	50	5.8		37	6.0	
P x S x M	(PGSTM)	50	11.4		37	11.4	
P x T x M	(PGSTM)	50	8.3		37	6.6	
G x S x T	(PGST)	1	38.8[a]	1	1	182.4[c]	8
G x S x M	(PGSM)	1	318.8[c]	10	1	314.1[c]	14
G x T x M	(PSTM)	1	103.1[c]	3	1	157.0[c]	7
S x T x M	(PSTM)	1	56.1		1	52.7	
P x G x S x T	(PGSTM)	50	5.1		37	7.2	
P x G x S x M	(PGSTM)	50	8.7		37	5.4	
P x G x T x M	(PGSTM)	50	7.1		37	3.8	
P x S x T x M	(PGSTM)	50	10.0		37	7.4	
G x S x T x M	(PGSTM	1	254.8[c]	16	1	56.3[a]	4
P x G x S x T x M	(PGSTM)	1	7.2		37	6.6	

[a] Significant at the .01 level

[b] Significant at the .005 level

[c] Significant at the .001 level

[d] These percentages were calculated by estimating the fixed-constants relationship for each of the non-persons sources of variation:

$$\theta_E = \frac{MS_E - MS_{(P \times E)}}{\frac{k\,(N)}{j}}$$

where θ = the fixed-constants relationship for any non-persons source, k = the number of treatments, N = the number of persons responding, and j = the number of levels of the factor of interaction. Each $\hat{\theta}$ was then expressed as a percentage of the sum of the coefficients (Hays, 1963, p. 382).

TABLE 14.5

RANK ORDER OF MEAN SCORES OF ITPLS ITEM TYPES

	First Administration					Second Administration				
		Design[b]					Design			
Rank	Mean[a]	F_1	F_2	F_3	F_4	Mean	F_1	F_2	F_3	F_4
1	18.12	-	-	-	-	19.45	+	-	-	-
2	16.94	+	-	-	-	17.89	-	-	-	-
3	16.67	-	-	+	-	17.24	-	+	-	-
4	16.29	+	-	+	-	17.18	-	-	+	-
5	15.57	+	+	-	-	16.39	+	+	-	-
6	14.96	-	+	+	-	15.89	+	-	+	-
7	14.92	-	+	-	-	15.76	-	+	+	-
8	14.55	+	+	+	+	14.03	+	+	+	-
9	13.69	+	+	+	-	13.29	-	+	-	+
10	13.04	+	+	-	+	13.13	+	+	+	+
11	12.63	-	+	-	+	12.82	-	-	+	+
12	11.33	-	-	+	+	11.84	+	+	-	+
13	10.14	-	-	-	+	11.58	-	-	-	+
14	8.75	-	+	+	+	9.24	+	-	+	+
15	8.57	+	-	+	+	9.21	+	-	-	+
16	8.20	+	-	-	+	8.97	-	+	+	+

[a]Scores are based on the sum of individual responses to the four items within a subset.

[b]F_1: Grade Level, F_2: Subject Matter, F_3: Teacher Approach, F_4: Teaching Method. Plus sign designates factor level 1; minus sign designates factor level 2.

The most interesting results are graphically presented in Figures 14.1, 14.2, 14.3, and 14.4.

Figure 14.1 displays the interaction between Grade Level and Subject Matter. This relationship indicates that the teachers judged the progress of pupils in the first grade to be facilitated more by skill learning than by content learning, while in the sixth grade the reverse wos true.

The relotionship between Teaching Method (drill or discovery) and Subject Matter (skill or content) is shown in Figure 14.2. Drill procedures were judged to be more facilitative when skills were being learned than when the goal of the instruction is the learning of content. The reverse relotionship was observed in the case of discovery methods.

Figure 14.3 shows the relationship between Teacher Approach and Teaching Method. Discovery techniques of teaching were judged to be most facilitative when the pupil wos the center of activity and control, while such techniques were judged less facilitative when the teacher was the center of octivity and control.

The observed significant three-factor interaction, Grade Level by Subject Matter by Teaching Method, is shown in Figure 14.4. It may be observed that though discovery teaching methods are judged to be more facilitative than drill methods, the use of either strategy is conditioned by grade level and subject matter. Drill methods are regarded as more facilitative in the first grade when used in conjunction with the learning of skills, while in the sixth grade drill methods are relatively more facilitative in relation to content learning. The observed significant third-order interaction is empirical evidence for the individuality of learning and teaching circumstances so often claimed by teachers.

Discussion

This research differs from many previously reported studies on teaching in at least three ways: a) the use of multi-stimulus test items, b) the methodical definition of item stimuli according to a standardized framework, and c) the systematic construction of the inventory according to an experimental design in which test items are conceived as treatments. Historical antecedents to this approach may be observed in the work of Guttman (1954-55), and Johnson and Stanley (1955), who reported arrangements of test stimuli according to factorial combinations.

The use of multi-stimulus items contrasts with the traditional procedure of seeking items deemed to measure only one factor of the subjects' response tendencies. Multi-stimulus items carry more

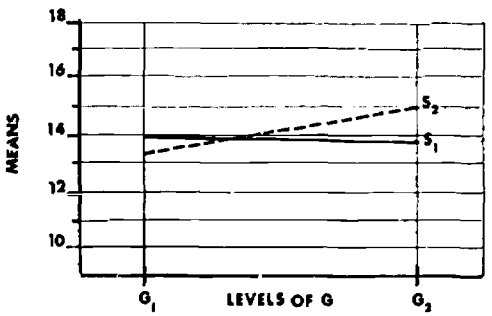


Figure 14.1 The two-factor interaction of Subject Matter and Grade Level.

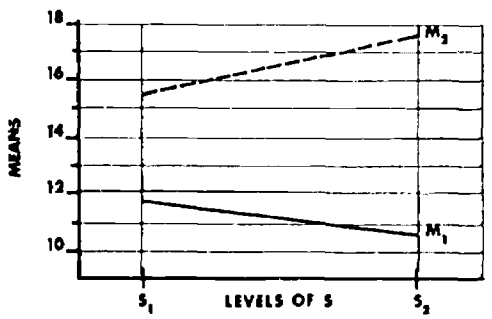


Figure 14.2 The two-factor interaction of Subject Matter and Teaching Method.

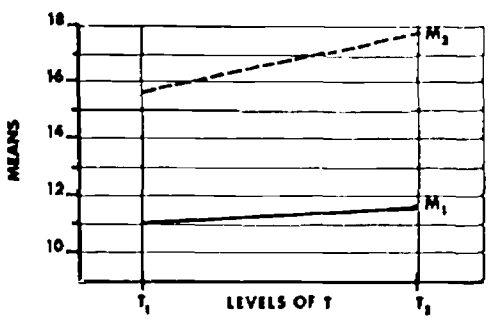


Figure 14.3 The two-factor interaction of Teacher Approach and Teaching Method.

Key to Interaction Figures

G: Grade Level
- G_1 = Grade one
- G_2 = Grade six

S: Subject Matter
- S_1 = Skill learning
- S_2 = Content learning

T: Teacher Approach
- T_1 = Teacher-centered
- T_2 = Pupil-centered

M: Teaching Method
- M_1 = Drill
- M_2 = Discovery

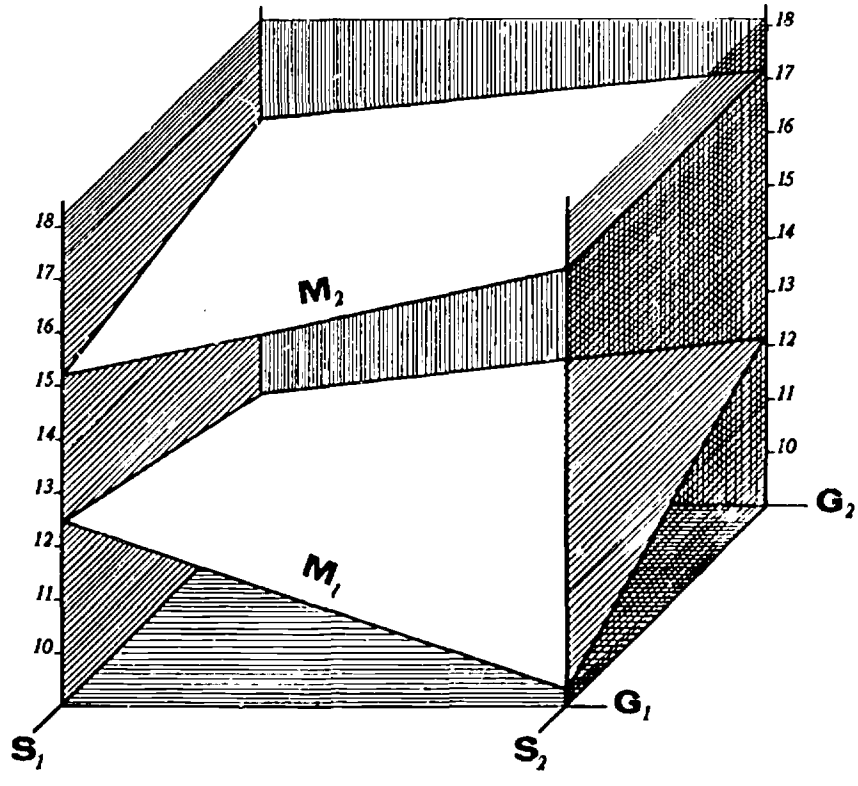


Figure 14.4 The three-factor interaction of Grade Level, Subject Matter, and Teaching Method

substantive meaning, for they approximate the multi-stimulus nature of classroom teaching situations. The teachers who responded to the inventory commented on the reality of the items. However, a few items were judged to be "unreal." For example, teachers complained that first-grade pupils would never be observed to engage in a described activity.

The specification of content for item development is often difficult. In the present case the a priori definition of item characteristics and their manner of combination allowed the development of a series of alternative statements which could be included in a single item. In this sense, the logical complexity of an item can be defined before response measures are obtained. An assumption basic to this approach is that teachers do think of classroom situations in multi-dimensional terms. This assumption strongly suggests that multi-factor interactions among teachers' classroom responses should be observable. Surely, teachers must operate in the classroom at a more complex level than that implied by a two-factor interaction.

The construction of the inventory according to an experimental design embodies several scientific advantages. In the present case, the special advantages are those typical of any factorial design (Cox, 1958): a) a high degree of precision in estimating the main and interaction effects, b) the opportunity to evaluate several interactions in a single experiment, and c) the definition of a framework within which a range of conclusions can be drawn and on which further experimentation can be built. This means that replication is relatively easy, that knowledge from the experimental outcomes is cumulative, and that significant outcomes can be further tested by systematic extensions of the basic plan.

The ITPLS provides evidence which supports the contention that teaching in the classroom is a complex interactive process. Every decision is affected by many factors, each contributing to the effectiveness of the teacher's influence.

c. ANALYSIS OF THE INSTRUCTIONAL COOPERATION QUESTIONNAIRE

In the initial stages of developing the Instructional Cooperation Questionnaire (ICQ), a pilot study[1] was made to test the efficacy of ICQ in measuring the extent of teachers' instructional cooperation in different kinds of staff organization. A summary of the average scores of different groups of teachers is

[1] B. S. Gregg, The Identification and Assessment of Operational Characteristics of Teaching Teams and Other Instructional Organizations, MS thesis, University of Wisconsin, 1965.

presented in Figure 14.5. On the basis of these responses the items were slightly revised and edited.

In its final form (see Appendix N) ICQ was attached to and administered along with ICLS to 212 teachers in 32 school districts.

Variables

ICQ scores were correlated with each ICLS item and with factor scores obtained from the image analysis of ICLS. In addition, seven teacher-characteristic variables were correlated with ICQ scores. These correlations were computed to investigate relationships between teachers' achievement and experience and their self-described teaching behaviors. The seven variables are:

1. Highest Credential
2. Highest Degree
3. Salary
4. Local Experience
5. Total Experience
6. Grade Spread
7. Grade Level

Some of the data for the seven teacher variables were missing. These results are based on complete data for 135 teachers.

Correlations

The correlations of ICQ with the seven teacher variables are given in Table 14.6. The matrix is noteworthy for the low correlations between ICQ and all teacher variables.

As might be expected, some of the teacher variables intercorrelate rather highly. Although the ICQ may measure the degree of cooperation among teachers, it does not appear to be related to any of the variables selected here for characterizing teachers. A future use of the ICQ results would be to study the relationship between the cooperation index and sorting experiments.

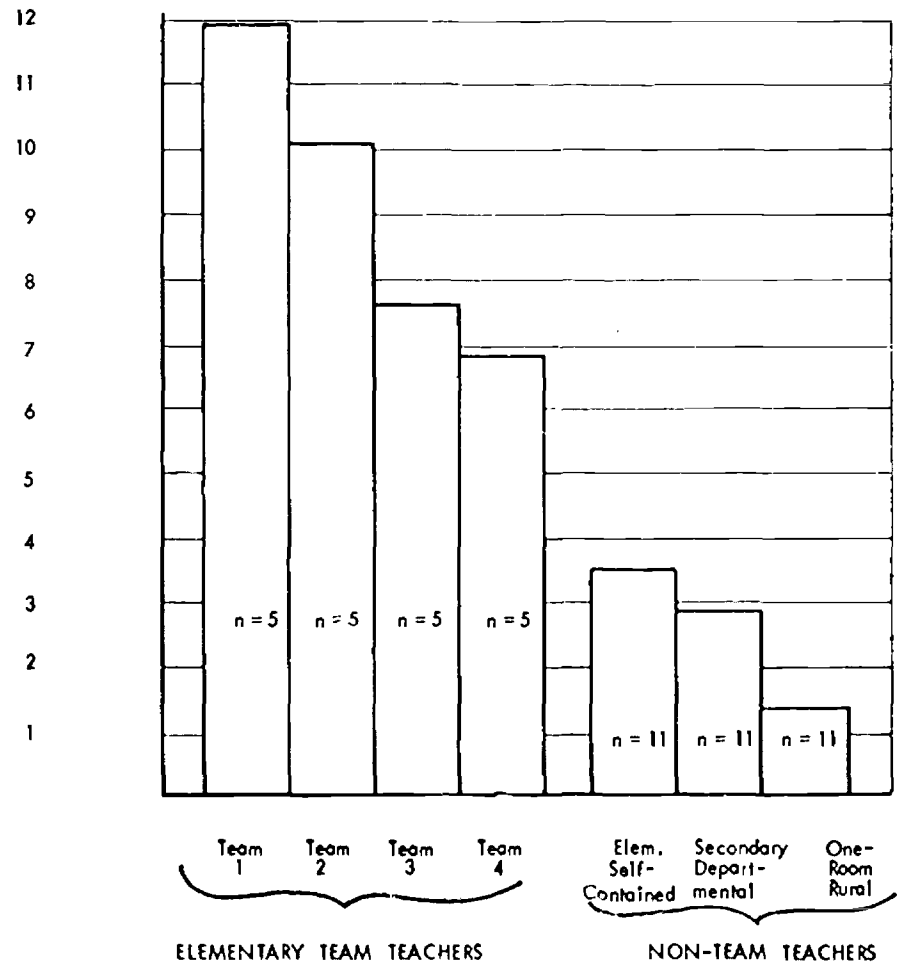
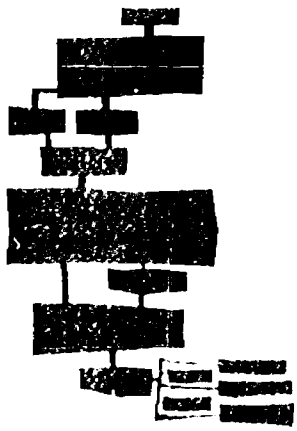


Figure 14.5 Mean scores on Instructional Cooperation Questionnaire for team teachers and non-team teachers

TABLE 14.6

CORRELATIONS OF SEVEN TEACHER VARIABLES WITH THE INSTRUCTIONAL COOPERATION QUESTIONNAIRE

Variable	1	2	3	4	5	6	7	8
1. Highest Credential	1.00	.24	.26	.32	.41	-.12	-.16	-.02
2. Highest Degree		1.00	.37	.08	.15	-.08	.04	-.05
3. Salary			1.00	.36	.36	-.39	.11	-.06
4. Local Experience				1.00	.68	-.13	-.02	-.16
5. Total Experience					1.00	-.14	-.05	-.19
6. Grade Spread						1.00	.04	.15
7. Grade Level							1.00	.09
8. ICQ								1.00



PART IV

Reflections on the Research

CHAPTER 15

APPLICATIONS AND IMPLICATIONS

The preceding 14 chapters are a condensation of over three years of research which was primarily concerned with developing new techniques for performing empirical investigations. The work was motivated and initiated by the question: Do team teachers differ from self-contained classroom teachers with respect to their views of facilitating classroom learning? Many people would immediately answer "yes" but they would find it most difficult to defend their answer. In systematic, empirical terms, what are the differences considered to exist between a team teacher and a self-contained classroom teacher? A variety of hypothetical differences might be described, but how can they be expressed in scientific terms? What is the nature of procedures required to compare the views of a "team" teacher with those of a "traditional" teacher without biasing the results one way or another? The two types of teachers may differ in many ways, but the question of concern to the researchers was: Do they differ with respect to the facilitation of student learning in the classroom? The history of the endeavor to develop an answer to this question is contained in the previous chapters. As reported, the major purpose of the study was not to obtain information which would answer the question directly, but to develop first a scientific approach which could then be used to determine the substance and structure of views held by team teachers and compare them with those of self-contained classroom teachers.

The most important product of the project is, then, a system of methods. The substantative results presented are interesting, but they must be considered exploratory baseline information. The methodological developments presented have been thoroughly tested, demonstrated, and examined. Valid judgments can now be made about their utility and future potential.

Essentially, the new methodology reported herein, categorization methodology, consists of four components:

1) Observing and collecting substantive, qualitative data,
2) Summarizing and organizing the elements of the data,
3) Manifesting and explicating the substance and structure of the data, and
4) Identifying the latent structure of the substantive manifestations.

A most important feature of the methodology is that there is no requirement to define the substance or specify the dimensions of the data before the research is initiated. Categorization methodology allows substance and structure to evolve under conditions which can be experimentally controlled but which still allow systematization of data handled in "naturalistic" or non-laboratory settings.

In many stages of the project, an explanation of the methodology would often perplex an uninitiated observer. One such person commented that it seemed the researchers were allowing teachers to do the thinking, an activity which is properly that of the researcher. Another observer commented that the basic data-gathering methods (interviewing, content summarization and sorting procedures) were too subjective. And a third person, after listening to an explanation of how Latent Partition Analysis allowed the identification of latent categories of information obtained from interviews commented: "You don't need all that fancy arithmetic to summarize the content of a depth interview!"

The skepticism of the methodology implied by the comments of these three observers was not shared by the teachers who participated in the data collection operations. The teachers typically responded with an interest and curiosity which did not deteriorate, even though their work, interviewing and sorting, required two to four hours of mental concentration and physical effort.

The skeptics commented on methodological aspects of the research, while the teachers commented on the substantive aspects. The difference between these the attitudes toward research has been succinctly stated by Bloom (1966):

> By substantive contributions I mean contributions to new ways of viewing a particular phenomenon, new understanding of a particular topic or problem, and new ways of stating the question or problem. Methodological contributions have to do with new procedures and techniques for research while substantive contributions have to do with research which has made a difference in the way we think about education and learning, in the view of a particular educational problem, and, we hope, in the way education goes on in the school or home.

This conceptualization of substance and method is helpful in assessing the contributions of the present research. Paradoxically, its contribution can be evaluated only by further research. In the following paragraphs, certain substantive applications and methodological implications of the research approach will be briefly mentioned for the purpose of recording one particular perspective of the achievements of the project.

Substantive Applications

Substantive applications of the research approach lead primarily to aiding the understanding of views of certain groups of people; it helps to understand the various ways in which a given content domain is perceived by two or more people or by two or more groups. Several examples of these substantive applications have been presented in the previous pages. In addition, three ancillary studies were carried out during the life of the project by colleagues of the researchers.

Lane (1966) completed a study of counselors' diagnostic concepts of a client's statements. The sorting task in that study used content units derived from a tape-recording of a client's description of his psychological problems. Three groups of counselors performed the sorting task: 19 inexperienced counselors in advanced training, 17 moderately experienced (fewer than five years) counselors, and 12 highly experienced (more than five years) counselors. The results of this study indicate that there are distinct differences between the views of inexperienced and experienced counselors.

Pruzek (1967) investigated the analytic classification of 100 achievement test items (from the Scholastic Aptitude Test) by comparing results obtained from an application of categorization and LPA methodology with results obtained from application of a standard factor-analytic approach. He concluded that "these items do not measure what certain specialists [sorters] apparently thought they measured" and that "one should be cautious about interpretations of factors from response data analysis which are based solely on content characteristics of the items."

A third study, now in progress (Cook and Miller, 1966), is endeavoring to identify the latent structure of problems of teaching the handicapped. The question asked in that study is: What behavioral concepts underlie problems which teachers of the handicapped perceive in the day-to-day behaviors and events of their classrooms?

Each of these three studies was directed toward understanding the substance and structure of certain persons' perceptions and cognitions. Their purposes have been to identify other persons' views, rather than to measure reactions to researchers' views which are implicitly or explicitly imbued into the substance of the research.

Methodological Implications

The several research techniques composing categorization methodology may be used individually or in combination. The analytic procedure, Latent Partition Analysis, is now well-developed and many different applications of it may be made immediately. The unique advantage which it provides is the ability to analyze and evaluate contingency matrices. Data in the social sciences are frequently summarized in the form of contingency matrices, so LPA should prove to be a generally useful tool in many social science disciplines. Combining this analytic technique with the sorting procedures allows a variety of experimental investigations of a substantive, or qualitative, information. It is possible to collect and evaluate the conjoint aspects of two or more concepts, such as "facilitating learning" and "facilitating mental health."

Similarly, it would be possible to investigate the perceptions and cognitions of such concepts as they are held by two or more groups, such as educational administrators and educational theorists. Or the methodology might be used to compare logically derived taxonomies of educational phenomena, for example, objectives of teaching, with psychologically derived classifications which result from a Latent Partition Analysis of data gathered by the Sorting Procedures. Though the technical parameters of such investigations are discussed generally in this report, much further work is required on the mathematical and computational components of Latent Partition Analysis. Wiley and Bock (1965)[1] have initiated work in this area in conjunction with studies of other techniques for analyzing the structure of qualitative data. Perhaps the major methodological implication of the research reported herein is to challenge the notion that qualitative research is automatically attended by a loss of qualitative information. It has been clearly demonstrated that the use categorization methodology retains and displays a high proportion of the "richness" of original qualitative data, even though it is considerably fragmented during the technical process of systematizing and interrelating the diverse, heterogeneous elements of a particular content domain.

[1] In 1965, R. Darrel Bock and David E. Wiley initiated a program of study entitled "Multivariate Analysis of Qualitative Data" at the University of Chicago. Their studies are supported by National Science Foundation Grant No. G-1025. In addition to continuing work on the LPA model, they have prepared papers on estimating a multinomial response relationship and on maximum likelihood procedures for estimating item parameters in the dichotomous case. The papers are available as research memoranda from the Statistical Laboratory of the Department of Education, University of Chicago, Chicago, Illinois.

Conclusion

The final evaluation of this research depends upon the importance which is assigned to understanding what and how teachers think about facilitating learning. More generally, it depends upon the importance which is assigned to understanding what and how persons think about selected aspects of human behavior. For example, of what value is it to compare the ways in which a possible future teacher thinks about facilitating learning to the ways in which a pedagogue thinks about facilitating learning? One such example was secured during the project, using the verb deck in a group administration. In Figure 15.1 and 15.2 portrayals of two contrasting viewpoints are given. Figure 15.1 displays the thinking of one particular student, about to enter training for secondary school teaching; Figure 15.2 reflects the thinking of one particular pedagogue, responsible for training prospective teachers. It is obvious from a study of these two figures that the student discriminates more finely than the pedagogue, whose gross discriminations appear to be emotionally based. Both persons received the same directions about sorting. The observation of the clear substantive and structural differences between the views of these two persons prompts the question: What will happen to the views of this student if he is trained by this pedagogue? Is it likely that the student will learn to be sensitive in analyzing teaching techniques? Will he learn to perceive important subtle distinctions between apparently similar teaching approaches?

An evaluation of the present research is dependent upon the value which is placed on understanding such situations.

Negative Psychological Attitudes That May Aid in Teaching

reprimands threatens demands

The Mechanics of Teaching

discusses drills
lectures tutors
repeats reviews
answers assigns

Carrying Out Administrative Rule

controls regulates
enforces permits
restricts penalizes

What Teacher Must Do Other Than Teach

supervises organizes
advises arranges
schedules plans

Placing the Student in Relation to His Peers

grades tests evaluates judges

The Non-mechanical Aspects of Teaching That May Aid the Learning Process

demonstrates illustrates simplifies
explains clarifies displays
interprets introduces exemplifies

Changing the Student's Views

persuades convinces
questions reasons

Positive Psychological Attitudes That May Aid In Teaching

urges reminds inspires
encourages impels stimulates
rewards commends confirms
reinforces

Figure 15.1 Verb categories expressing a student's view of facilitating learning.

Undesirable Techniques

threatens restricts
reprimands interprets
enforces controls
impels demands
penalizes lectures

Evaluative Techniques

tests evaluates
grades judges

Desirable if Utilized from A Child Development Point of View

rewards repeats persuades
permits drills
answers convinces

Aspects of Desirable Teaching

illustrates reinforces stimulates
discusses urges plans
arranges simplifies questions
encourages regulates displays
reminds introduces confirms
clarifies supervises advises
demonstrates organizes assigns
inspires schedules exemplifies
explains commends reasons
tutors

Figure 15.2 Verb categories expressing a pedagogue's view of facilitating learning.

E P I L O G U E

POTPOURRI THOUGHTS

RELEVANT TO PROJECT NO. 2018

AS PERCEIVED BY A "CAPTURED" TEACHER

---Lois S. Johnson

A great deal of staff talking is not a waste of time, but an important procedure for conceiving ideas, finding errors, and giving the Project a shot in the arm.

As for me, the captured teacher, this research realm was a strange and disquieting country. I was impatient with what I thought was exceedingly slow progress. At first the talk, talk, talk seemed such a waste of time. Later I realized that from the talk, talk, talk emerged structure, principles of procedure, creative ideas, and theoretical designs. I learned that one does not begin to solve a research problem until it has been thoroughly studied and understood.

The working language was new and strange to me; at first it seemed mere gobbledygook, e.g.:

- *Variables*
- *Clusters*
- *Design matrix (Sounded like high fashion for matrons)*
- *Frequencies*
- *Ratios*
- *Theoretical schema (Trickery)*
- *Factor analysis*
- *Blocking (Tackling)*
- *Judging (That ye be not judged)*
- *Collating*
- *Sorting*
- *Coding*
- *Latent categories (They were so unexpected!)*
- *Stratification*
- *Loading (Not doughnuts and coffee)*
- *Punching (Never feigning)*
- *Randomizing (You are left holding the bag)*

I have profound respect for statistical knowledge and procedures.

If their language was new to me, so was my teaching-thinking new to them--dam excepted. I was as amazed at their ignorance of what real teaching means as they were at my ignorance of statistics and its importance. Sometimes I tried to tell them, but they did not understand; sometimes they tried to tell me, but I did not understand. Through the process of rubbing thoughts against one another I began to get a bit of the statistical thought, and they began to get a bit of the teacher thought. I never could be a statistician, and some of them, I am sure, could never be teachers. So each has his niche.

While the structure for the Project was being built and moved into position, I was absorbed in reading educational literature on classroom organization, teaching trends, and educators' opinions. I annotated these articles and books for staff reference. I read from John W. Gardner to Sylvia Ashton-Warner. Soon there was such an over-lapping of thoughts that I began to be bored. Dmn never allows a researchist to stay bored for long, so he started me on a little task that lasted for two years. I began an annotated bibliography of psychological abstracts concerned with the measurement of teaching. For the years 1950 through 1964 I checked 1999 titles, searched 223 abstracts, and annotated 123 abstracts. Whenever my staff work became slack, I retreated to and suffered in the University Library stacks. My opus magnum was finished in the summer of 1965. I felt a bit wan but vini, vidi, vici.

Many aspects of this basic research added interest and variety such as: interviewing, talking with superintendents, principals, and live teachers, preparing materials, Q sorting, blocking, judging, and sorting, and it m writing.

INTERVIEWING

Dmn and I went out after the raw material. A great contributor to the planning and preparation of materials for the interviewing was jb--a stalwart gal in all the Project activities. The first year dmn, jb, and I set up an interviewing schedule. It was not the best, but it was a beginning, with the wrap-up being aided by sos. We, dmn and I, interviewed about twenty teachers. The following year we interviewed thirty-two teachers with an improved interview schedule. A book could be written about our interviewing experiences but I will only mention a few highlights and a few lowlights.

We used the tandem type interview--both pedaling, but dmn putting forth the most effort and keeping us pointed in the right direction. When he seemed pressed going up an incline or down a decline, I would step up my pedaling. If his New Zealand colloquialisms became too overwhelming, I would translate them to the mystified teacher. Tandem style suited us fine; we each knew our role, and we were perceptive of each other's thinking and motives.

Our trips usually began early in the morning and ended late at night. Most of the trips were made in the University fleet cars.

When our beloved adp joined our staff, we acquired a pilot who took us in a Cessna if the weather permitted. We were high on those days.

Before leaving on a trip we methodically went through a list of items necessary for traveling: directions, maps, gas, money, tapes, recorders, microphone, extension cord, schedules, travel sheets, directory, et cetera.

Now and then, which was almost always, we were pressed for time because drm liked to be actively working until actual take-off. If road construction or ice impeded our swift progress, our lunch might be a brown bag from Krogers; otherwise, our lunchtime was the high point of the entire day--especially if we were road-weary, or there was pecan pie.

On long driving trips, and there were many, drm and I would polish up the schedule, admire the scenery, settle educational issues, jot down profound insights, ride silently or become hilarious, tell tall teacher tales, or talk, talk, talk. Drm I would recommend as a traveling companion.

On the way home after an interview, we would evaluate the experience. After two and a half hours of asking and listening as we taped through the long afternoon, the pupils of our eyes would feel stiff and set, rigid, that is. Fatigue was not foreign to either of us; it felt more like the blindstaggers. But, from almost every interview we felt wiser, and oftentimes we had taped a nugget here and pearl there.

SUPERINTENDENTS

To one who considers merit rather than chance--randomizing was a traumatic experience; I always felt as if I were gambling, or that I was being gambled.

On reaching a random-selected teacher, we would contact the random-superintendent. (The antics of randomizing, indulged in by drm especially and later rfc, reminded me of witchery. Occasionally they asked ldm to add seasoning.) They came in all sizes, shapes and conditions. Many were great, some ambitious, others resigned, many dedicated, some resting in position, some struggling against losing fights, here-a public relation expert, there-a budding building contractor. It was always exciting to see the superintendent, talk with him,

and maybe take him to lunch. Some of them listened, were interested, asked intelligent questions, and made discerning comments.

It was important that they be oriented to the Project's activities and purposes. This they seemed to appreciate. There were those who saw the basic worth of the Project and were genuinely glad to have a part in it; and then there were those who saw it as a bandwagon and anxiously climbed on.

I really liked all of them and empathized with their difficulties.

PRINCIPALS

Principals are a peculiar breed; they are, in a sense, middlemen between the teacher and superintendent, a precarious position. They seemed to be always aware that they had to be careful about what they said and what they promised. Because of the directives from the superintendent, they were courteous and cooperative whether or not it was their nature.

TEACHERS

I have a more sensitive respect for excellence in teaching.

The teachers. My-oh-my. How they loved to talk after they recovered from their initial fright and concern. Many did not want to stop talking when the taping time was terminated. Some reacted as if the interview were a therapeutic treatment, a'la couch.

When they realized they were making a professional contribution, the talk flowed and their descriptions were invaluable. They were all amiable and very cooperative. They have such little time to talk about their own teaching, and not often do they have such receptive listeners.

In the early interviewing days, I had a problem of physically controlling my reactions to some of the practices and beliefs described. I finally learned to adapt myself to the teacher's tenor. I came to understand their viewpoints, sympathize and appreciate this opportunity of close, personal communication with them.

They were grateful to drop the cloak of educational theory, and principles expounded in method classes and tell what they really did in the classroom to get children to learn. "The teacher tells research" hit a responsive chord.

We did not search for good or bad teachers, but what a joy when we would tape an imaginative, creative, and perceptive teacher. For those less able, I felt a sense of empathy and great appreciation, for they were giving all they had: trying to do their best, sincere and committed, all trying with dedication to facilitate the learning of their students. I was amazed to find all teachers expending a tremendous amount of energy in the classroom. It is impossible to understand this drainage of energy a teacher experiences unless one has experienced it.

Q SORT

This second year, for a short period, a Q Sort was used after the interview was terminated. The Q Sort was four decks of cards that Jim and I played to reveal the image we had of the teacher just interviewed. One deck pointed up her behavior and ideas during the interview; the second deck showed her classroom procedures and practices; the third deck revealed the principles and concepts of teaching which she held; and the fourth deck uncovered her perception of the teaching role. (I loved writing Q Sorts. Sp was a great teacher.)

This was a time-consuming, arduous task. After interviewing it was just too much, but we did use it enough times to secure some data concerning its function and worth. I came to understand that research, as with teaching and learning, is like an iceberg--9/10ths of the work being invisible.

BLOCKING, JUDGING, AND SORTING

These activities of blocking, judging, and sorting were an important part of the Project. For accurate information I refer you to the documents where jb and later jc have recorded them for posterity or perplexity. An experience to remember was in preparing the materials and in contacting and watching the substitute teachers struggle as they were compelled to think. From the sorting arrived data. The finagling which followed on the computer--with rgs and dcs at the helm--will always remain a mystery to me. Out of it, however, came "latent categories" which after some study seemed to make some sense.

ITEMS

No matter how polished a first draft seems to the writer, it is still a first draft and needs improvement.

Items were written for the inventory from the blocked teachers' statements. I had found very few items in the psychological abstracts that were similar to the kind we thought we should write. We really had no model. No one seems to know enough about items to construct realistic ones. They seemed so artificial to real situations in teaching.

The first year the kick-off in this game was made by rmp with tl and ag punting occasionally. Later in the year, with the help of another teacher, enough items were generated for the first inventory. In the second year a second inventory played havoc with some of my ideas of teaching but were smoothed over by mvo and dmn. Hours were spent discussing and writing. Four items in a half day was the average. In this last week I turned out over 125, but of course, they were very first-draftish. I would like to know how to write better ones.

INVENTORIES

Two inventories were given to groups of teachers. I do not know the results. I only had indications of the respondents' reactions as I watched them take the test, and as I read their comments.

RESEARCH SECRETARIES

Bless them.

LITTLE MEMOS OF EVALUATION

Keep me on the mailing list.

These quotes will be remembered:

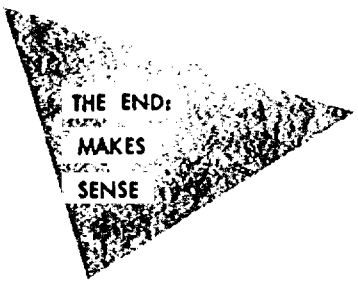
John Ciardi: I have been speaking to teachers here and there, and I have noticed some of the things they are told to say.

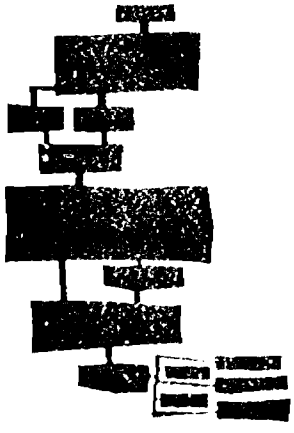
John Guy Fowlkes: The focal point of schools should be on the learners and learning rather than on teachers and teaching.

Philip Lambert: If it isn't difficult, why do it?

Don M. Miller: O-o-o-o-o-o, now I know!

My personal reward is probably not commensurate with my performance; I probably gained more than I gave. However, since I survived I probably have developed some interesting tolerances; when I return to the classroom I am apt to "go up the down staircase."


THE END:
MAKES
SENSE



APPENDICES

APPENDIX A

Interview Guidelines and Interview Schedules

PART I

GENERAL INTERVIEW GUIDELINES

A. Background for the interviewers

1. Purpose of the interview:

   a. The immediate purpose of the interview is to record on tape, for later analysis, information concerning a) what the teacher does in her classroom to help children to learn and b) the perceptions and cognitions of the teacher with respect to facilitating learning.
   b. Ultimately, the interview data will be used for studying those aspects of classroom behaviors and events about which teachers think in common ways.

2. Guidelines for interviewing:

   a. Establishing mutual confidence
      i. Continue introductory discussion until a relationship of mutual confidence has been relatively well established.
      ii. The teacher should be given every opportunity to ask questions.
      iii. Teacher must understand that the interview is highly confidential. It is for the purpose of trying to learn more about the reality of classroom teaching, not for evaluation of individual teachers or school staff.
      iv. Interviewer should be completely frank and open about the research, its goals, and the status of knowledge about teaching.
      v. The posture of the interviewer should be that of a good listener, completely sympathetic with the teacher being interviewed.
   b. Strategies for the discussion
   c. Use the schedule of inquiries only as general guidelines
      i. Allow interviewee to be spontaneous and divergent
      ii. Seek specific illustrations where appropriate and possible

B. Information for the superintendent and principal

1. Description of research project
   a. Confidential nature of present work.
   b. Answer questions.

2. Explanation of interview procedure and plans--inform superintendent and principal that with the teacher's permission a tape recording of the interview will be made.

3. Future arrangements for returning to interview.

C. Background for the teacher

1. Overview of project and interview (off the tape)
   a. Introduction
   b. Confidential nature of the interview
      i. Make sure teacher feels free to say anything she thinks is relevant.
      ii. Tell teacher that superintendent and principal will not have access to any information she may give.
      iii. Ask the teacher not to discuss the interview content with any other teacher because the research will continue for two years and other teachers may be involved.
   c. Information on the project
      i. State that you are conducting research on teaching.
      ii. This research is being funded by the U. S. Office of Education and the University of Wisconsin.
      iii. This project is studying classroom teaching, and we are interviewing teachers because only teachers can give us information on what really takes place in the classroom.
   d. Recording
      i. State that it will be advantageous to the research work if our talks are recorded. Talks can be more informal if note-taking is not necessary.
      ii. Inform teacher that her name and school will not be connected with the recording or any other part of the research work except that she will have a code number so that she will not be picked again.
      iii. Mention that you may have to check the tape recorder to be sure it is recording and note counter number.

2. Purpose and process of interview (on the tape)
   a. Interview purpose and procedure (on tape so teacher gets used to being recorded)
      i. Reiterate the purpose of this project in that it hopes to identify what a teacher must do in order to get children to learn. We are interested in the teacher's approach in the classroom--what she does, what she's required to do, what she would prefer to do, what she would prefer not to do.
      ii. Substitute teacher has been provided because this interview is a professional activity.
      iii. Questions are general and you have no expectations of the teacher's response.
      iv. Explain that to some questions she may have no immediate response but that there is time to talk together in order to understand her view of teaching.
      v. Explain that her answers will be contributing to understanding and knowledge of teaching.
      vi. Explain that the tape has to be checked occassionally so that you can be sure of getting back to Madison with the important information you need.
   b. Warm-up questions: Begin with personalized questions so as to lead in to the more difficult general questions. (Suggested maximum time 5 mins.)

For example:

i. How did you happen to become a teacher?
ii. What part of your job do you particularly enjoy?
iii. What kind of a class (children, room) do you have this year?
iv. What are you doing that's new or exciting?

(Tape Check: One interviewer keeps talking with teacher.)

INTERVIEW SCHEDULES

Schedule I

Sequence of Topics for Discussion	Illustrative Topics and Questions Expected to be Discussed
A. General aspects of teaching (time 50-60 mins.)	
1. What should a teacher do the first day and week of a new school year?	Seating arrangement Materials
2. Imagine a new teacher who is thinking about her first days in the classroom. What are the things she needs to consider seriously and be certain of doing?	Discipline
3. How do you go about getting to "know" your pupils?	Control
4. How do you try to make a child want to come to school every day?	Interest-motivation
5. What are the important things for a student teacher to learn during her practice teaching?	Exceptional children
6. What do you believe good teaching is? Perhaps there is some experience you could tell us about which illustrates good teaching.	Classroom organization
7. Could you contrast this with an example of poor teaching.	Physical set-up
BREAK	
B. Subject-matter and curriculum (time 50-60 mins.)	
1. Reading--- Do you follow the textbook sequence exactly? Do you find the pupils use reading rules? How many groups can you handle successfully? How can you keep the low group from feeling low and the high group from feeling too high? How do your pupils use individualized reading? The library? How do you handle book reports?	Have you changed your approach to teaching any subject or to teaching in general?

Sequence of Topics for Discussion	Illustrative Topics and Questions Expected to be Discussed
2. Arithmetic---	
How do you feel about new math?	
How do you make sure the children learn the fundamentals? Games? Rote memorization?	
Do you have ways of teaching thought (word) problems which are successful?	
3. Social Studies---	
What materials and resources do you use?	Motivation
What are you studying now?	
What units do you cover in your grade?	
How do your students feel about SS?	Teaching facts and concepts
Do you use audio-visual aids? For what purpose?	
What skills or types of knowledge do you think pupils learn best from social studies...facts, concepts, structures.	Manuals
4. Science---	
What do you expect to study in science this year?	Grouping committee work
What have you studied or what are you studying now?	
Do you teach science the same or differently from other subjects?	
Have you changed your approach while you've been teaching?	
How do you handle experiments or demonstrations?	Testing evaluation
What skills or types of knowledge do you think pupils learn best from science?...concepts, facts, structures.	
5. Language---	
What do you use for a guide in language teaching?	
How do you work to bring out creativeness in your class?	
How do you establish conformity to correct usage?	
Do you correct and hand back all papers that are handed in?	
How do you handle mechanics such as margins?	
Do you insist that what is taught in language be applied in other subjects?	

Sequence of Topics for Discussion	Illustrative Topics and Questions Expected to be Discussed
6. Spelling--- What is your pattern for the week? How do you choose words for class or individual learning? What do you do with children who miss words on a final test?	
7. Handwriting--- Do you think that a child can keep both what he is writing and how he is writing in mind? What system do you use? How do you work with a left-handed writer? How often do you evaluate?	
8. Health--- What do you do in the health area? How responsible are you for emotionally disturbed children?	
9. Special subjects--- Do you teach art, music, or physical education?	
10. Evaluation-testing--- Do you like your marking system? Do you have a way of making a child and his parents understand what you are trying to tell them with the marks? Do you hold grade conferences with children before they take their report cards home? What do you feel is the purpose of marks?	
11. Return to general thoughts--- After discussing aspects of your teaching as you have been doing, perhaps you would attempt to answer a more general question again: On what points or beliefs about teaching do you feel you might differ most from other teachers? On what points do you feel teachers as a group might vary the most in their ideas of what you should do in the classroom?	

(stop tape)

Termination

Call for any comments or questions that the teacher may have in mind from the entire interview.

Off the tape again:

Close the interview with thanks and appreciation and a reaffirmation of the confidential nature of the interview.

Schedule II

The interviewing guidelines, purpose, and process were the same as those outlined in Part I this appendix.

The schedule used in this series of interviews consisted of modification of Interview Schedule I. The revised schedule included asking about learning problems, emphasizing more the suggestions which might be made to student teachers, and ways of beginning and ending classes.

Sequence of Topics for Discussion

A. Learning Problems and Planning (time 50-60 mins.)

1. What are some of the most difficult learning problems you've encountered?
   "academic'---in reading, arithmetic, etc.

2. How did you try to overcome these problems?
   What did you do?
   Would you describe some of the details?
   Why did you approach the problems in these ways?

3. How do your plans take into account these learning problems?

4. What suggestions and advice might you give to a student teacher about learning problems?

5. Would you describe what you did this morning beginning with the time you first entered your classroom?

6. What are some of the things you did the first day of the school year?

7. Think back to yesterday's classes---describe some of the things you tried to do.

8. How would you have conducted the classes this afternoon?

BREAK

B. Subject Matter and Procedures (time 50-60 mins.)

1. Would you describe some of the ways in which you begin class periods?
   e.g., in reading, in arithmetic

2. Describe in detail the reading class you taught this morning. (Follow with other subjects).

3. Describe some of the things which happen after a lesson has begun.
   What is happening when actual work is going on---when everybody is doing something?

4. Would you describe some of the ways in which you had a lesson or class period? How do you end the day?

Sequence of Topics for Discussion (cont.)

5. If you were training a student teacher what are some of the important things you would have the student learn and observe?
   i. Techniques of presentation
   ii. Techniques of evaluation
   iii. Techniques of rapport and control

Termination

PART I I

Interview Schedule III

The interviewing guidelines, purpose, and process were the same as those outlined in Part I of this appendix.

Interview Schedule III consists of four major sub-schedules:

Schedule 3-A: Organization of Typical School Days
Schedule 3-B: Subject Matter and Curriculum
Schedule 3-C: Long-Range Classroom Goals
Schedule 3-D: Teaching and Learning Problem

As each of these schedules required about 50-60 minutes of time, only two schedules were used for each interview. The decision as to which schedule was used with a particular teacher was determined by an experimental design (see Chapter 6).

INTERVIEW SCHEDULE III

A. Organization of Typical School Days

Level 1: Initial stimulus inquiries concerning the major topic	Level 2: Illustrative ideas for use in stimulating further discussion	Level 3: Examples of topics and terms sometimes used in initiating detailed discussion
1. Do you have a particular way of beginning each day?	setting the tone for the day priorities techniques for planning and organizing	
2. What kinds of things do you do the first day of the new year? the first week?		
3. Do you prefer to teach a certain subject at a particular time of the day?	flexibility	
4. Would you give the sequence of your activities this morning? (Continue through a day's activities)		
5. What do you do about your schedule when something unexpected happens?		unexpected changes, fire drills, assemblies, visitations, emergencies, shorten all periods omit certain subjects
6. What do you do when you haven't finished a lesson and the time is up?		
7. What do you do with a child who goes off on a tangent when the class is discussing a particular subject?		
8. How do you become acquainted with individual pupils?		
9. Do you have any exceptional children for whom you have to plan?	exceptional children	bright, slow, physically handicapped, special abilities (in art, music, science, etc.)
10. In what ways do pupils take part in planning?	rules, activities, units, goals	
11. What do you feel you must do before and after school in the way of preparation and planning?	secretarial tasks helping children teacher's planning preparation of materials	

A. Organization of Typical School Days (continued)

Level 1: Initial stimulus inquiries concerning the major topic	Level 2: Illustrative ideas for use in stimulating further discussion	Level 3: Examples of topics and terms sometimes used in initiating detailed discussion
12. Do you have a particular way of ending each day?	physical order of room reminders evaluation of day with pupils	desks neat, floors clean, materials put in correct places, things to bring home, what did we learn today?
13. To what extent do you work with other teachers?	materials, curriculum, teaching	
14. Do you find it necessary to do any kind of planning before school begins in the fall?	curriculum materials schedules	

In all four schedules, the interviewers asked at appropriate times the following general questions:

a. Can you give an example? Can you give another illustration?
b. Would you describe in more detail?
c. Could you describe why you did that?
d. What happened after that?
e. What did you do?

INTERVIEW SCHEDULE III

B. Long Range Classroom Goals

Level 1: Initial stimulus inquiries concerning the major topic	Level 2: Illustrative ideas for use in stimulating further discussion	Level 3: Examples of topics and terms sometimes used in initiating detailed discussion
1. What do you hope your pupils will have learned, by the end of the year, in subject matter areas? (Could you give examples?)	mental skills and abilities	research skills reading skills awareness of current events skills and abilities for grade level
a. What will they be able to do by the end of the year that will indicate they have reached these goals?		
b. Could you give an example that would illustrate how you are helping pupils reach these goals?	techniques	
c. How do pupils become aware of these goals?		
d. What indications do you see that pupils are making progress toward these goals?		
e. What do you do to encourage this progress?	conferences	
f. In what way did today's or yesterday's work contribute toward these goals?		
g. What specific goals do you have for individual pupils? (Continue through each subject area: reading, language, arithmetic, spelling, social studies, science and handwriting)		
2. What other kinds of learning, aside from subject matter, do you hope your pupils will have gained by the end of the year?	social values, attitudes	respecting the ideas of others open-mindedness tolerance cooperation

B. Long Range Classroom Goals (Continued)

Level 1: Initial stimulus inquiries concerning the major topic	Level 2: Illustrative ideas for use in stimulating further discussion	Level 3: Examples of topics and terms sometimes used in initiating detailed discussion
	emotional development	taking success and failure self-control
	individual values	pride in one's work neatness and orderliness punctuality working to capacity good study habits self-reliance evaluation of self and work creativity using talents standing for what he thinks
	attitudes and interests	racial world affairs wide reading tolerance

3. How did you establish rapport with your pupils?

INTERVIEW SCHEDULE III

C. Subject Matter and Curriculum

Level 1: Initial stimulus inquiries concerning the major topic	Level 2: Illustrative ideas for use in stimulating further discussion	Level 3: Examples of topics and terms sometimes used in initiating detailed discussion
1. Would you describe how you conducted your reading class this *morning*?	teacher style or pattern organization	grouping whole class
a. Would you describe other techniques or patterns you have used?	motivation instructional procedure evaluation teaching facts concepts skills types of thinking	testing grading
b. What techniques have you used in teaching this subject that have proved helpful in facilitating pupils' learning?	special techniques for learning	grouping individualized remedial work open-end experiences for widening horizons creative experience
c. If you find you have to reteach, what techniques do you use?		
d. How do you provide day-to-day continuity in this lesson?	from day-to-day within a class period	reviewing
e. Do you find it possible to help your pupils relate this subject to their other classes or interests?	with special classes with world outside school	
f. What audio-visual aids are you able to use with this subject?	follow-ups	
g. How do your manuals and guides aid you in preparing your lessons?	subservience or choice	Preparations, use during class, work taken directly, work taken but modified special techniques
2. (Continue above pattern through remaining subject areas: arithmetic, spelling, language, science, social studies, handwriting)		

INTERVIEW SCHEDULE III

D. Teaching and Learning Problems

Level 1: Initial stimulus inquiries concerning the major topic	Level 2: Illustrative ideas for use in stimulating further discussion	Level 3: Examples of topics and terms sometimes used in initiating detailed discussion
1. Would you describe some of the particular kinds of learning problems you have this year in reading?	working with children planning instructing evaluating individual needs	
a. What have you done, or what are you doing to meet this problem?		
i) How have you been handling these situations?		
ii) How have you been helping the pupils overcome these problems? What kinds of things have you been doing to help the pupils handle their problems?		
b. Do you feel you are able to anticipate some of these problems?		
c. What suggestions would you give an inexperienced teacher to help him handle these problems?	techniques of: organization preparation instruction	give clear and concise directions avoid excess talking try to understand individual needs know pupils' backgrounds pace tempo of instruction flexible schedule meet physical needs provide variety in learning experiences keep classroom orderly
(Continue through other subject areas: arithmetic, language, spelling, social studies, science, handwriting)		

D. Teaching and Learning Problems (Continued)

Level 1: Initial stimulus inquiries concerning the major topic	Level 2: Illustrative ideas for use in stimulating further discussion	Level 3: Examples of topics and terms sometimes used in initiating detailed discussion
2. What learning problems do you feel you have handled the most satisfactorily?		
3. Have your pupils had any problems learning to behave in the classroom? (Follow with questions a, b, and c, as on previous page)		
4. Have any of your pupils shown emotional problems? (Follow with questions a, b, and c, as on previous page)		
5. What subject do you think tends to pose the most learning problems?		
6. In what subject do the pupils seem happiest with their work?		

APPENDIX B

Guide to Conducting Field Work

UNIVERSITY OF WISCONSIN
RESEARCH ON CLASSROOM TEACHING

GUIDE TO CONDUCTING FIELD WORK

PURPOSE OF TRIP: _____

_____

_____

SCHOOL ADMINISTRATOR(S): Name - _____

Address - _____

MEETING: Date - _____ Time - _____

Place - _____

GENERAL INFORMATION

A. BACKGROUND OF RESEARCH

1. The aim of this project is two-fold: 1) to identify and describe teachers' ideas and views of classroom teaching and 2) to identify the activities which teachers carry out in order to facilitate learning in the classroom. Little knowledge is currently available concerning the structure and content of variables which may affect classroom activities. In order to gain some representative and generalizable knowledge of these variables, we have decided to seek the help of teachers who are presently in the field. For several reasons, it will be most valuable for us to have these statements of teachers' actions and beliefs categorized by other teachers into groups of similar ideas concerning the FACILITATION OF LEARNING. That is, we are interested in knowing what behavior problems teachers must be concerned with in getting children to learn.

B. STATEMENT OF POLICIES OF ANSWERING QUESTIONS

1. Nature of project - answer any questions.
   a. Briefly explain Cooperative Research Branch of USOE and the nature of basic scientific research.

2. How selected - we want a variety of teachers with a variety of backgrounds. You (the teacher) are a representative of a certain grade level and a certain experience level. If necessary, explain the random selection procedure in very brief form.

3. Questions of Evaluation - Explain that there is no evaluative function involved. All the information is confidential, the name of the teacher, the school, or the district is not to be used.

4. Results - A report will be prepared and you will all receive a copy of it in the near future (the teacher is contributing her professional knowledge to the project).

GENERAL LIST FOR FIELD TRIP ARRANGEMENTS

Administrator(s) _____

Date _____ Time _____ Place _____

Data to be Obtained: _____

_____

Transportation: Car _____ Plane _____

Map _____ Car Reserved _____

Gas _____ Pilot _____

Credit Cards _____ Money _____

Directions _____ Passengers _____

Money _____

Passengers _____

Travel Schedule

Leave _____ Arrive _____

Begin Data Collection _____ Return _____

Food: Lunch _____

Dinner _____

Superintendent (or representative) _____

Letter? _____ Date sent _____

Probable Expenses _____

_____

Location of School and Room; Background Information on Teachers; Miscellaneous.

_____

_____

_____

CHECK LIST OF TRAVEL AND INTERVIEW MATERIALS

Item	Trip				
	Date:	Date:	Date:	Date:	Date:
1. Day's timetable					
2. Directions					
3. Map					
4. Money					
5. Gasoline					
6. University receipt blanks					
7. Travel Report Forms					
8. Wisconsin School Directory					
9. Interview calendar					
10. Notepaper					
11. Interview schedule					
12. Interview Rating Report					
13. Tape Recorder					
14. Tapes for recorder					
15. Stenorette					
16. Stenorette tapes					
17. Microphone					
18. Extension cord					

AFTER ADMINISTRATION

A. Check materials.

1. Clean and straighten room.

2. Thank superintendent (or representative) personally.

B. Complete reporting forms (this is one).

C. Return to office.

1. Check and label all materials.

2. Letter to:

Superintendent _____

Principal _____

Other Administrator _____

_____

Teacher(s) _____

_____

APPENDIX C

TRANSCRIPTION OF A TEN-MINUTE SEGMENT OF AN INTERVIEW

Interviewer$_1$: *We'd like you to tell us some of the things you do every day in your classroom.*

Teacher: It's so difficult for me to really sit down and tell you what I do everyday, because I know I do a lot of thinking beforehand but, ah, one time I really do stop and think! And I take lots of notes of, "oh, how I can change too", if for instance I'm listening to a practice teacher in the front doing things, and I find out, "Oh, well, you know I should watch those things too, especially your language! Ooh!!"

Interviewer$_2$: *You were saying something about being on your feet and watching their mistakes for a certain reason. You just repeated that when he went out of the room. Why do you do that, did you say?*

Teacher: Oh, so that I can catch any mistakes that they make so I don't have to spe d too much time the next day reteaching exactly what I thought they had gotten the day before. Whereas, if I catch it right at that moment. As I said before, I'm not trying to stump these children or keep testing them all the time. That's one thing I never try to do is keep testing them. They're supposed to be learning and I, I expect that they should have it right and I want them <u>all</u> to have it right at the end of the day, but I don't want them to have it right without a complete understanding, because then, I would have gone around and told them the right answer which is what I never, never do, tell them any answers at all. But rather, he'll say, if he asks me, "How to do it," then I'll ask him a question, "How <u>do</u> you do it?" or "Let's look at it and see what is the best way to do it."

Interviewer$_1$: *How do they know that they're right if you don't tell them any answers?*

Teacher: It doesn't sound right to them. Well, they're either, when they do come up for questions because they're completely stumped on it. Maybe it's a word to fit in somewhere in their workbook. Then we'll take it and I will sit down and spend time with the child and figure it out and tell him that every time he notices now that there's an "e" on the end, he should find out whether or not it makes the vowel before it say long "a", that type of thing.

Interviewer$_1$: *Those children who don't come up, how do <u>they</u> find out if they are right, though?*

Teacher: Well, I catch that when I walk around, up and down, the aisle. See, I catch that then, and then I can help them individually.

Interviewer$_1$: *Do you tell them?*

Teacher: No, I'll ask them a question which would lead them into the right line of thinking about what it might be.

Interviewer$_1$: *So, they're really telling themselves.*

Teacher: Yes, or I will be guiding their thinking, yes. Science: perhaps the science sheet that they'd be working on; the story is above, the questions are below and they're way off track on their answer. Then we go back up into the story. "You find out where it tells something about that answer", then they'll get the paragraph that is talking, generally, about that. Now, "Let's find out, what does the question say?" or "Read the question out loud." Now we've

Teacher: got to answer the question! Usually he gets stuck on the "how": "Is it how, why, when, or where?" And he'll answer a 'how' question when it should be a 'why' question. Then I ask him to read it over again, keep reading it over again till he puts the 'why' in there; it doesn't say 'how', it says 'why'. And he discovers it himself.

Interviewer$_1$: Then you don't ever give them the answers to these things.

Teacher: No, no, I let them look for it themselves.

Interviewer$_1$: We'd like to change, so we may discuss the same things, but focus the discussion for a while in terms of what you want these children to be able to do by the end of the year. What do you want them to learn by the end of the year?

Teacher: Well, let's see. First of all, in reading, can I take it generally? I want them to learn something that I know that, many, many people that go to college never, ever learned when they started out reading. The first three grades of school are, perhaps, the most important; they set the pace for the rest of your school. If you don't learn how to read and read well, you're just out when it comes to college, because reading goes along with listening, goes along with everything that they have to do. First of all, when a child reads a story, he reads it the first time to get the gist of the whole thing. Then if he gets stuck on any words he works with the phonics part. That's why I teach phonics; he figures it out that way. He reads it the second time to find out. Now, first of all, he thought it with the words what, all the words were, and he doesn't know anything. You can ask him the name of the child. He's so concerned and so interested in every one of those words as he's going through with his reading. The second time he reads it, he reads it to find out certain details, main ideas of the story. Many times I'll ask him to pick out the main ideas of the story. This is, in a way, kind of like outlining and picking out the important things and skimming it over. The third time he reads it, I want him to skim; I want him to read it quickly and fast, so that he can read it to enjoy it, but at the same time, he is reading his story so that he gets expression and all the other little things that come in. I do want them to read their story three times. We stay on the story, also, I would say, two reading class periods.

Interviewer$_1$: What other things do you want them to be able to do by the end of the year?

Teacher: I want them to be aware of just everything. I mean, I don't want them to go through a book and just look at pictures, just as if they were flat pictures. I want them to really see into something and read into things and discover why we are learning this particular thing, or what's the value of it; how can they use this in their daily living. And also, but most important thing of all, I want them to listen and to think, those two things.

Interviewer$_1$: What about in other areas?

Interviewer$_2$: .....besides reading?

Teacher: Well, I would almost say that that applies to just about everything. I want them to be really sensitive about everything that they are doing so that they can use it, not just in school. This isn't something that you just learn for the minute and then forget about it when we leave the school and close the door. I want them to use this when they go home, too, and I

Teacher: want them to think about what they are doing. The most important thing is to teach these children that they should try to prevent their own mistakes. They should profit from their mistakes. If they really think about what they are doing before they do it, whether it is out on the playground punching somebody, or really organizing a game, I'm trying to discover who are the leaders in my room and to teach them all to have a little leadership. They don't all have it, but to teach them all to take the initiative once and a-while and not just say, "I can't do it," and they never have any confidence in themselves at all, ever. I would like them all to have confidence, to try to help them to have confidence. If I know that there is one particular thing that a child is good at, even if he is a real slow, slow child, to bring it out, so that everybody else can say, "See, he can do something too!"

Interviewer$_1$: You've mentioned some of these things that you would like them to learn by the end of the year, say in reading. In what way did your work today contribute to reaching this goal of the end of the year?

Teacher: What I did this morning? Oh, well, without this morning, they couldn't do tomorrow's work. I mean, one thing goes on to the other. Now, like we worked with the suffixes (I mentioned before, that's why it's fresh in my mind) because the words that are coming up in their reading book all have endings on them. As soon as you stick an ending on a word you have a completely new word, so if they recognize these endings on the ends of words. And, in science we are going on and we have been studying about the stars and now the science lesson that would be presented this afternoon will be for them to watch for the Big Dipper tonight in the sky and also the moon and what phase it is in at the moment.

Interviewer$_1$: How do these things contribute to what they will have <u>learned</u> by the end of the year, or <u>have</u> by the end of the year?

Teacher: Well, once again it would probably be making them aware of things and this is just a step to something else. They might really get interested in the stars and maybe they'll ask their parents to get them some books downtown and they'll read into it further. What I really do is just open the door, I mean, they have to do the rest. I can't say just how far each child <u>will</u> go; every child is going to go in his own different way.

Interviewer$_1$: What are some of the basic ways in which you try and open the door for them? What do you think are some of the very helpful things of getting that door open?

Teacher: Well, first of all I explain to them that there's a constellation in the sky called the Big Dipper and that if they look at a certain star in the Big Dipper, it points to the North Star. One little girl's father has a telescope and she's going to invite some of the children over to look through the telescope up at the stars at the Big Dipper. This will be sometime soon and I don't think it will stop just there, I think there are going to be some fellas that will be really interested in Mars. Mars fascinates them. On the second grade level, I mean, it really amazes me. One little girl came back and said that she was reading about rays of light coming into the upper atmosphere and I thought that was really interesting; that she came back and used the word "ray". And, we're all watching the moon and how it changes, and "Does it really change, or is it just in a different position?" Many of them have gone to the library and brought back books and things about that.

Interviewer$_2$: *Now, aside from science, in what other ways are you opening the door for them, apart from subject matter, maybe?*

Teacher: Well, everything that we do all goes back to reading again, and trying to get them to read. And they are learning all these new words, which is the most important thing in second grade is just reading. Because if they can read their story problems they aren't going to have any trouble with their combinations in drill and that type of thing. Well that's something they've just got to memorize. You just have to sit down and do that. But I'm trying to teach them to read and I want them to read in any way whether it's reading in numbers or reading in science and learning new words. And now, they learned a new word "telescope", they learned science when they first started out with that. I'm just trying to open the door to reading because everything in no matter what class you take, anywhere, is just reading, and if you can read, you are pretty well set because after all, ideas that are found in books come from all over, and they are all nicely organized in one little book and if you can read and read well, that's the most important thing that I am interested in, is reading.

Interviewer$_1$: *Apart from strictly subject matter things, how do you want them to be at the end of the year? What would you like them to have achieved for the end of this year or be able to do at the beginning of next year? Or <u>be</u> like?*

Teacher: Well, I'm trying to help their character, is that what you have in mind? I'm trying to show them the difference between right and wrong, that type of thing. And trying to help them how to be better citizens and help them to respect that so that's one of the reasons I go through the Pledge of Allegiance. How can they stand up and say the Pledge of Allegiance and go sit in a show some place and boo when a child gets up? And another thing, we don't laugh at other people's mistakes. We have to learn that we all make mistakes and I show each one of them their mistakes, and that we aren't perfect and I make mistakes, too. Sometimes I put a sentence on the board and I left out a word. And I'll bring the attention to the whole room that if you had copied this and "why didn't more of you find my mistake--look for my mistake, if I made one, and we'll correct it." I'm not afraid to correct it right in front of everybody and I think they should know that I'm not perfect. There seems to be some sort of an idea that teachers don't make any mistakes and this makes me angry because you get snappy little notes and one of the things that I think that these parents too should realize, is that lots of things that aren't taught in the home and sometimes I know I rub a little the wrong way because these children have to learn that there is a way to act and a way not to act. And we just don't push and shove and have to push somebody else to get ahead our own way; that type of thing--character building? Yes, I do a lot of little incidental things like that.

Interviewer$_1$: *Can you think of an illustration? Something specifically that happened recently?*

Teacher: Well, I have one little girl in my room that they just don't have a very good background as far as home life is concerned. And I think for the first time she is just realizing that she should comb her hair (in the morning when she comes I give her a little comb) and that you should be fairly presentable. You don't have to have too much but you can be clean. And she always wants to have her own way. She wants to be the boss and she's not that kind of a person that should be the leader but she should step aside and let somebody else.

Teacher: But that her family has told her that if she wants something she just goes and gets it and that's all there is to it. I mean, you want something, first come first serve and who's ever in the way just push them out of the way and get whatever you want. She's really calmed down since she's been taught both on the playground. I've asked other children to help her to straighten her out a little bit that instead of saying "No, you can't play with us; we don't want you in our bunch," to explain to her the right way, and that those are the only conditions under which she can play with them. Then if she plays according to the rules, and if she misses a turn in jump rope then she takes the end of the rope just like everybody else does. And I think tnat she is coming along fine. This works in the classroom and works on the playground.

Interviewer$_1$: What about a classroom incident?

Teacher: Well, I can't think of anything in the classroom that would show where I have ...I mean any incident that was really that noticeable where I had any trouble of any kind.

Interviewer$_1$: Do you talk to the whole class about these things?

Teacher: Well, I would never single this little girl out, ever. If it were something really drastic in the classroom. It seems that just looking at them stops them for the moment but then when they are dismissed to go to the lavatory to take the child aside. Or if it's so disturbing, I just walk out of the room and say, "Johnnie, would you bring some books?", and maybe he would pick up this one book and as he is walking out into the hallway to hand me the book, I got him out in the hallway and he's just walked out in the hallway to bring this book. Maybe I want him to take it upstairs or maybe I was going upstairs anyway to bring the projector upstairs and then I'll just ask him if he'd carry the cord. See then I have him out in the hallway and nobody knows that he has gone, "I called him out in the hall." I didn't call him out in the hall, he's helping me, but at the same time I have an opportunity to talk with him. I don't think I've ever embarrassed a child so that he just absolutely cried.

Interviewer$_1$: Do you have a thing about what you want these children to learn by the end of the year? Do you have any specific goals for individual pupils?

Teacher: Well, I have one little boy in my room right now that is the most intelligent scatter-brain you could ever hope to meet. He is really a sharp child, oh, is he really sharp and he can't use any of it. It's just laying in his head and he just can't use it. He just doesn't know how. And there's another little boy that's coming early in the morning and I'm trying to help just to discover and show him all the mistakes he makes and that he should catch those mistakes because he's intelligent enough to catch them before he makes them.

Interviewer$_1$: How do you work with him when he comes in the morning?

Teacher: Well, this intelligent scatter-brain that I have, is always out the window; you can always just see it. He gets the kind of look in his eyes and he just sort of floats out the window and that's immediately when I call on him every opportunity I can or to ask him to come up and give an explanation. I do like to have the children be teacher once in a while. That's one thing

Teacher: I like to do. And they will come up and perhaps it's working with money and I'll have a child pick out some money and he should know how much he's got in his hand and he'll call up another child and count the money out to that child and the other one has to tell him whether or not he is right.

APPENDIX D

Instructions for Content Summarization of Interview Recordings by Judges

INSTRUCTIONS FOR TEACHERS ACTING AS JUDGES

Aim of the Project

The aim of this project is two-fold: 1) to identify and describe teachers' ideas and views of classroom teaching and 2) to identify the activities which teachers carry out in order to get children to learn. Little knowledge is currently available concerning the structure and content of variables which may affect classroom activities. In order to gain some representative and generalizable knowledge of these variables, we have decided to interview teachers who are presently in the field. To date we have interviewed over 30 elementary teachers and have tape recorded the content of these interviews. It is at this point that your job comes in. Since we have recorded these interviews as they have taken place, you can help us by putting the teachers' ideas in a more workable form. In order to perform this job, you will need the following information:

1. Your Job

   a) It is your job as a judge to listen to a tape recording of an interview with a teacher and to transfer information about the ways in which the teacher facilitates learning from the tape to the Judge's Report of Interview Sheet. Because we want to know what teachers consider important in getting children to learn, we are purposely asking other teachers to extract relevant information from the tape recordings of interviews.
   b) Please realize that all aspects of the interviewing process are confidential. Each teacher who has been interviewed has been assured that everything she says will remain in the strictest confidence. You are requested to help us maintain the confidential nature of the research by 1) saying nothing about the contents of the interview to anyone outside the project staff and 2) in case you should recognize either the teacher being interviewed or persons mentioned on the tape, by keeping this information private.
   c) Each statement should be concerned with only one idea---that is one action, practice, or belief of the teacher.

2. Type of Information Needed

   a) Record information about the teacher's actions and practices in the classroom and any of her beliefs, ideas, or views about teaching.
   b) In addition, record any reasons the teacher offers for what she does or what she believes.

3. Description of a Recorded Interview

   You will hear the voices of two interviewers (a man and a woman) and the teacher being interviewed. The interviewers, through their questions, will try to get the teacher to talk about what she does in the classroom and what she believes it is her job to accomplish. Concentrate on what the teacher has to say, remembering that some of her remarks may not be relevant to your task. In general: record any information which you believe will tell us what teachers do in their classrooms to facilitate children's learning.

4. Training Session

The training session will consist of four parts which are described below in general terms. More detailed instructions will be given by the training instructor.

Part A: You will be given lists of ideas which another teacher has found important in another interview. You will have ample time to study these samples.

Part B: You will listen to a practice interview and follow the ideas which another teacher felt it was important to record.

Part C: You will listen to a portion of a practice recording and abstract the information you feel is important. You will then have a chance to compare your ideas with those of another teacher.

Part D: Working under conditions identical with those of the final work session(s), you will judge a 20 minute section of a taped interview.

5. How to Record Information

Look at the Judge's Report of Interview Sheet accompanying these instructions.

a) Interview Code Number: At the top of every sheet you will find a space for the code number of the teacher being interviewed. This number is on the box containing the tape and on the tape itself. Please record this number on every sheet you use.

b) Judge's Code Number: Please be sure to fill in your judge's code number in the upper right hand corner of every sheet you use.

c) Stating Actions or Beliefs: On the left side of the sheet are the spaces in which you record the teacher's actions and practices in the classroom or her beliefs about teaching.

d) Stating Reasons: To the right is the word 'because' followed by several lines. In these spaces you record any reasons which the teacher offers for her actions or her beliefs.

e) Numbering: If Report pages are numbered before beginning work, there is no need to number individual statements.

f) Duplication: Do not worry about duplication of ideas. However, if you are sure that the same idea has already been recorded, it is not necessary to do so again.

g) Breaks: Feel free to take short breaks during the work session if you need them. In fact, we advise you to take a break when you feel your powers of concentration lagging.

6. The Task Itself

When you have completed the training, you will begin work on one of the recorded interviews. In order to insure that you accurately record the teacher's ideas and actions, and whenever possible her exact words, you may stop the tape to record information or rewind and replay it if you need to listen again.

7. Previewing a Tape

Begin work on a tape by previewing its content. Listen to selected portions of the tape, totaling between 15-20 minutes, to get an idea of the kind of

statements the interviewed teacher makes. We think the time spent in previewing will save you time in the long run. Please preview the first three tapes you judge. After that you may consider the preview optional. If you find it helpful, continue the practice.

8. Working Time Report

It is most important that you keep an accurate record of the time you spend working on each taped interview. A report sheet has been provided for this purpose which asks you to note the time at which you begin work on a given tape, the time and length of breaks, and the time at which you finish.

9. Summary Report

Each teacher who works for us on judging is asked to fill out a summary report when she is finished. This report form is in your folder of materials. We would appreciate your looking at the form before you begin work so that you know the kinds of criticisms and suggestions we would like you to make concerning the job of judging, the training session, the materials and work schedule. Any comments or criticisms you make will be of use to us in the future.

INSTRUCTIONS FOR TRAINING JUDGES

The training of elementary teachers to judge a tape recorded interview is a morning's project and follows a single schedule, whether the teachers are inexperienced in the task or have been trained previously and need only to be refreshed in the procedure.

Materials Needed

The following materials should be included in a folder prepared for each trainee. The folder should be coded with the trainee's number.

1. A set of trainee's instructions
2. A supply of judge's report forms
3. A supply of sharp pencils (approx. 5 per judge)
4. A supply of time reports

The training instructor should have prepared ahead of time the following equipment and materials:

1. Tape recorders with earphones
   Ideally there should be one machine for each judge so that judges are free to work when they have time. If such arrangements cannot be made, their work schedules will have to be staggered.[1]
2. Tapes of all interviews to be analyzed
   Tapes should be randomly assigned to judges, two judges per tape.[2]
3. Training tapes
   There should be a training tape for each trainee on which are recorded the various sections of interviews to be used in training. (Only one training tape is necessary if there is not one machine for each trainee.)
4. Check copies of items
   For each part of the training session there should be a set of check statements previously judged by teachers or project staff.
   Part A - Exemplary items to study
   Part B - Items to study with the tape
   Part C - Items for checking trainees' judging (5, and two 10 minute sections)
   Part D - Items for checking trainees' judging (20 minute criterion section)

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[1] One solution to the tape recorder problem, used in this project during the first interview study, is to use a language laboratory. The language laboratory machinery must allow each judge to work on a different recording and to stop the tape when necessary. The laboratory used in our first study did not allow the judge to rewind and replay the tape.

[2] Before allowing judges or blocker to work with the master tape from an interview, a storage copy of each tape should be made.

Informal welcome of trainees

As the teachers arrive for the training session, they are greeted by a project member and asked to fill out information relevant to their being paid (in the case of this project a substitute teacher's pay card for the Madison Public Schools). Each teacher is given a folder of materials and asked to read through the set of instructions and to mark any statements which she does not understand.

Introduction of the project and project staff

Formal training begins with an introduction of the project staff and words of welcome from the Project Director. The Project Director will stress the following points: a) the project and its aims b) the importance of teachers in accomplishing these aims. Throughout the training session, teachers should be made to realize their importance to the project. Since no one person can remove all the information from the tape and since we need as much as possible of the information pertinent to facilitating classroom learning, it is essential that teachers make the selections which are unavoidable in the judging process.

Aims of the project

Following the words of welcome by the project director, the project director (and/or training instructor) will continue with a discussion of the section of the instructions entitled 'Aims of the Project.' Teachers will find it easier to do their work if they know something of the overall purpose of it. It must be stressed that the project is not concerned with evaluation of teachers but with finding out something about the reality of classroom teaching and learning, i.e., what teachers find it necessary to do in order to get children to learn. Some of the things they will do are not those they would be most happy doing, but they find that the reality of the classroom necessitates such actions. Therefore, it must be reiterated throughout the training session that judges are of no value to the project if they record only the information with which they agree. We want as much of the information from the tape as possible, whether the judge personally believes the practices are good or bad.

Training: Part A

Part A of the training session is meant to familiarize the trainee with the type of statement which he should make about the content of the interview. The teacher should be given a copy of the statements and reasons (Judge's training, Part A) taken from interview 9012. Trainees should have time to study them and to ask any questions which come to mind. The instructor will then make the points about statement writing which are marked on his copy. These comments include: a) Notice the verbs which are frequently used, e.g., give, make, plan, believe, ask, etc. b) Notice that there are fewer reasons than statements. c) Get the teacher's wording whenever possible---it is not always necessary to quote. d) Concentrate on what goes on in the classroom---the teacher's actions and practices and children's responses or participation.

Training: Part B

Part B of the training session is meant to familiarize the trainee with the tape recording and the content of an interview. The trainees listen to a section of an interview and follow a set of statements and reasons made by another judge (not

blocked statements). These judged statements are marked Judge's Training Part B. Trainees may ask the instructor to replay parts of the type* or may ask questions, for example about the way in which statements have been phrased.

Recording Information

At this point in the training session, the instructor should go over the section of the trainees' instructions entitled 'Recording Information.' The instructor should make sure trainees have copies of the Judge's Report of Interview forms.

Training: Part C

Part C of the training session is meant to give the trainees practice in removing information from the tape in the form of statements and reasons. This section should consist of the trainees' analysis of the 5-minute and two 10-minutes sections marked for Part C. Depending upon the facility with which the trainees acquire the skill of recording information, the final 10-minute section may be eliminated. Trainees are given report forms and the instructor plays the first section of tape (5-minute)*. Since the instructor will not be able to stop the tape each time a trainee requests, it will be better that he not stop it at all (for purposes of training only). Teachers should be told to do their best on the non-stop task and that they will be able to stop, rewind, and replay the tape on the final judging task. After working on the 5-minute section the teachers are shown the set of statements which another judge has removed from the same section. After trainees have had a chance to compare their work, either with the dittoed statements or among themselves, they will proceed to work on one or both of the 10-minute sections in the same way.

Training: Part D

During Part D of the training session, the teachers are set to work at their respective tape recorders, each working on the same section of interview 9012. Conditions are identical with those of the final working session(s). Teachers may stop, rewind, and replay the recording as they feel the need. There is no final set of statements against which the teachers may compare their work. When teachers have completed this 30-minute section, the instructor will collect their work and will check it against a set of blocked statements for a test of reliability.

It is strongly advised that judges now have their lunch break, during which the instructor can check to see if any trainee has failed to meet the criterion.[1] If so, individual training (or omission of this judge's reports) may be necessary. After lunch teachers can begin work on the final judging of tapes.

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*Unnecessary if each trainee has a machine and copy of the training tape.

[1]As a check on the trainee's understanding of the judging task, his work should be compared with that of another teacher or project staff member. The criterion can be set at 80 to 95 percent similar content.

Final Words: (Reminders)

The training instructor should make a point of emphasizing the following matters before teachers begin work on the final task.

1. Number a set of judge's report forms before beginning and use them in that order. If sheets are numbered correctly there is no need to number items.
2. Record your judge's code number on every report sheet.
3. Do not worry about duplication of statements. In the long run it will take you more time to check to see if the statement has been made exactly the same before than to record it again.
4. In all probability, there will be fewer reasons given than statements made.
5. The aims of the project: Our aim is not to evaluate teachers, but to find out what teachers think it is necessary to do to get children to learn. Therefore,
6. Record information from the interview regardless of whether or not you personally agree with the teacher.
7. The task requires a good deal of concentration. Take breaks as often as necessary in order to maintain a high level of concentration.
8. PLEASE.....do not forget to fill out the working time report!

Working Time Report

Discuss the manner in which the form should be filled out, stressing that it is most important that the report be faithfully and correctly kept. This form requires the judge to keep an accurate record of the time she works on each tape and the time she takes for breaks.

D. Report Forms

1. Judge's Information Sheet

2. Working Time Report

3. Report of Interview Sheet

1) Judge's Information Sheet[1]

Name_____

Local Address_____

Code No. of the Teacher Interviewed_____

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[1]When stenciled, appropriate space should be left between questions.

Teaching Experience

Number of years full time_____
Number of year substituting_____
Grade level (s)_____

Your answers to the following questions will be appreciated by those of us working on this project. They will be valuable in helping us to handle the information from interviews with teachers more efficiently and thoroughly. Please feel free to make any comments on the back of this sheet not specifically called for by the questions?

1. Keeping the aims of the project in mind, can you think of another way of handling the information gained in a teacher interview which might be more efficient and thorough than the procedure which you have followed.

2. Assuming that you accept the general procedure of analyzing the tape recorded interview, are there any minor suggestions which you have in order to make the job you have completed
   more efficient?
   more thorough?

3. After having listened to an interview, do you have any suggestions for questions which it would be good to ask teachers in future interviews?

4. Do you have any comments about the effectiveneness of the Judge's Report of Interview sheet?

5. Do you have any comments or suggestions about the training session and its effectiveness in preparing you for the analyzing job?

Judging: Working Time Report

Tape No._____

Judge No._____

Date_____

Began at_____

Break No. 1 at_____ for_____minutes

Break No. 2 at_____ for_____minutes

Break No. 3 at_____for_____minutes

Finished at_____ (including the time needed for checking forms and numbering pages)

Not to be filled in by the judge _____

Total number of statements_____

Gross working time _____

minus

Time for breaks _____

equals

Net working time _____

JUDGE'S REPORT OF INTERVIEW[1]

Teacher Code No._____
Judge No._____
Date_____

This teacher lets faster students go ahead and lets slow ones go at their slow speed. because faster ones can't wait for others and slow ones can't keep up with the fast ones.

This teacher thinks you shouldn't give fast students just busy work to do when they get their work finished. because _____

This teacher would not have a student copy paragraphs from a book for discipline--instead she would have an extra assignment for students to do such as read and report on a person. because _____

[1]When prepared for use, cut on 8" x 13-1/2" (legal sized) stencil.

APPENDIX E

Instructions for Content-Blocking of Summarized Interview Recordings

INSTRUCTIONS FOR TEACHERS ACTING AS BLOCKERS

The Aim of the Project

The aim of this project is two-fold: 1) to identify and describe teachers' ideas and views of classroom teaching and 2) to identify the activities which teachers carry out in order to get children to learn. Little knowledge is currently available concerning the structure and content of variables which may affect classroom activities. In order to gain some representative and generalizable knowledge of these variables, we have interviewed teachers who are presently teaching in elementary schools in Wisconsin. To date we have tape recorded interviews with thirty-two teachers. Two teachers have listened to each recording and made statements of the interviewed teacher's actions and beliefs which they believe are relevant to the way in which she facilitates learning in the classroom. At this point your job as a blocker comes in. It will be your job to listen to the interview and, following the judges' reports, make a single set of statements representing the interviewed teacher's actions and beliefs about facilitating classroom learning.

The Blocking Task

The blocker follows the judge in the process of analyzing the content of tape-recorded interviews. It is his job to compile a single report, exhausting if possible the interviewed teacher's actions and beliefs relevant to the manner in which she facilitates learning in the classroom. In order to accomplish this task, you will study simultaneously the two judges' reports and listen to the tape recording of the corresponding interview. In compiling the final report of the content of an interview (a blocked report) you should do the following.

1. Mark for later recording on the dictating machine all statements unique to either judge.[1]

2. Select and mark for later recording the better (clearer, better worded, etc.) of all statements common to both judges.

3. Reword or rewrite these statements (see 1 and 2) to provide for a maximum clarity of statement.

4. Write on a judge's report for later recording a statement of any important action or belief of the interviewed teacher which has been overlooked by both judges.

5. Strike completely any statement which does not represent what the interviewed teacher said.

6. Strike completely any statement which is not relevant to the manner in which the teacher facilitates learning in the classroom.

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[1]It should be clear from the marking system used by a blocker exactly which statements were selected from each judges' report and which added by the blocker. Statements should be numbered so that a project staff member can make a second recording of blocked statements if necessary.

After you have marked, rewritten, and written statements in the above manner, you will go back and record the final statements on the dictating machine from which a type-written copy will be made. You will then edit the type-written copy for errors in English and for statements which are ambiguous. Whenever possible correct these errors yourself, leaving only those which you cannot correct for the project editor. Mark those statements which are ambiguous or poor in spite of any changes you can make.

Training Session

Training in the blocking procedure will include the following:

1. Training in the use of the tape recorder and the dictating machine.
2. Listening to a 10-minute selection from an interview and following two judge's reports for that section.
3. Practice in blocking a 10-minute section of an interview. You will be able to check your results with those of another blocker.
4. Blocking of a 10-minute section of an interview.
5. Criterion blocking of a 30-minute section of an interview.

Work Reminders

Before Starting

Begin a time report for each tape. It is most important that you remember to fill out this report.

In the Process of Blocking

1. Work carefully. There is no time limit for completing the blocking of an interview. We suggest that it may take you between 2-1/2 and 3-1/2 hours at the beginning, but after you become more familiar with the task, we expect that your working time will decrease.
2. It will be best if you plan to finish the blocking of one section of an interview at a sitting. It becomes difficult for others working on analyzing interviews if tapes are left on machines.
3. In recording statements on the dictating machines, the following conventions must be observed:
   a) Introduce your report by saying: "The following is the blocker's report for teacher _____. First statement."
   b) Before each successive statement you must include the words 'next statement' in order that the secretary know when to begin new statements.

Before Leaving

1. Refile judges' reports in the storage box.

2. Mark the dictating machine cartridge with the code number of the interview---the number on the box containing the tape-recording of the interview.

3. Leave the cartridge in the box marked "Blockers' Tapes Ready for Transcription."

4. Return the tape-recording of the interview to the proper storage box.

5. Unplug and cover all machines.

6. Be sure you've signed to be paid.

7. Return the key to the research room if you are the last to leave.

Editing Transcriptions of Your Reports

When transcriptions of your blocked statements are ready, they will be left for you to edit. Please edit them when you have time, either before leaving or at home.

INSTRUCTIONS FOR TRAINING BLOCKERS

The training of elementary teachers to block the judges' reports of tape-recorded interviews is a morning's project. Ideally teachers should be trained in the morning, the instructor should check their work during the noon hour, and they should proceed with their first interview in the afternoon. This task is complex enough to make it desirable that teachers put their training to use as soon as possible.

Materials Needed

1. A tape recorder for each teacher being trained.[1]
2. A dictating machine for each teacher being trained.[1]
3. Copies of the training tape for each trainee.[1] These tapes include:
   a. A 10-minute section of an interview for practice in listening to the tape and following the judges' reports.
   b. A 10-minute section for practice in blocking.
   c. A 10-minute section for practice in blocking or for criterion blocking.
   d. A 30-minute section for criterion blocking.
4. Copies of the two dittoed judge's reports for each section of the training tape for each trainee.
5. Three sets of blocked statements for each section of the training tape for use by trainees and training instructor in evaluating the quality of work being done.

Training: Part A

Trainees should be instructed in careful use of the tape recorder and dictating machine. Emphasize that machines should be unplugged and covered when not in use. If remote control apparatus is used, the teachers will need to know how to disconnect it and operate the machine without it as well as how to use it. (This information is necessary in case of an emergency and also for using the fast forward which does not operate by remote control.)

Training: Part B

The second step in training is to have the trainees listen to a tape recording of an interview and follow the corresponding sections of the judges' reports. Each teacher should listen independently, having previously practiced threading her machine with the training tape. Answer any questions trainees may have after trainees have finished listening.

Training: Part C

The third step in training is to have the trainees block a 10-minute section of interview. Each teacher should work independently selecting, correcting and inserting statements according to the steps given on the first page of the trainee's instructions. Check to be sure that trainees are marking and correcting clearly on the dittoed judges' report sheets. They must

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[1]Subject to modification depending upon the availability of machines.

be able to record statements directly from the judges' report sheets. After they have finished their work, give them the copy of blocked statements for Part C against which they can check their results. Answer any questions trainees may have, and then have them thread the dictating machine and record the blocked statements from this practice session.

Training: Part D

Trainees will now block another 10-minute section of interview. If they have shown that they need this section for further practice, when they have finished blocking, give them the set of blocked statements against which they can check their work. If this section is used as the criterion[1] section, you need not give them the blocked statements.

Training: Part E

If Part C was used for further practice in blocking, then this 30-minute section should be used as the criterion section. Trainees should work independently, and you need not show them the blocked statements when they have finished.

Work Reminders

At this point the trainees should understand their job as blocker. Go over the section of their instructions entitled 'Work Reminders.' Answer any questions they may have. Remain in the room in which the blocking is being done during the first work session, ideally the afternoon of the day on which blockers were trained. After one day's work the blockers should feel competent to continue on their own.

D. Report Forms

1. Blocker's Information Sheet

2. Working Time Report

The Judge's Information Sheet and Working Time Report in Appendix D are adapted for blockers' use.

E. Examples of Blocked Statements

The following statements are the blocked statements corresponding to the judge's statements.

11-8 This teacher, when dealing with a slow class, will identify the few students who may be more gifted and let them work on their own at a faster pace than the rest of the class because they would otherwise become bored.

11-56 This teacher feels that it is wrong to give busy work to students who have finished a class activity ahead of the others.

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[1]As a check on the trainee's understanding of the blocking task, his work should be compared with that of another teacher or project staff member. The criterion can be set at 80-95 percent similar content.

11-69 This teacher feels it is wrong to have a student copy a certain number of paragraphs or pages from a book as a means of discipline or punishment.

APPENDIX F

Materials for Administering Sorting Experiments

Instructions for Teachers Acting as Sorters

The Aim of the Project

The aim of the project is two-fold: 1) to identify and describe teachers' ideas and views of classroom teaching and 2) to identify the activities which teachers carry out in order to get children to learn. Little knowledge is currently available concerning the structure and content of variables which may affect classroom activities. In order to gain some representative and generalizable knowledge of the variables, we have interviewed teachers who are presently teaching in elementary schools in Wisconsin. To date we have tape recorded interviews with thirty-two teachers. Other teachers have listened to these tape recordings and put the information in the form with which you will be working today. The following statements are examples of the materials you will use today.

1. This teacher feels that a picture on the child's accumulative record is helpful in getting acquainted with a child at the beginning of the year.

2. This teacher feels that if helping one student is going to hold back the rest of the class, then it is wrong to work with that one student during class time.

At this point your job as a sorter comes in. For several reasons, it will be most valuable to us to have the statements of teachers' actions and beliefs from the interviews grouped by other teachers. Your job will be to put together those statements which concern the same aspect of the teacher's job of facilitating learning---that is, of getting children to learn. The way in which you group the statements will tell us something about what you, as a teacher, feel must be done in order to get children to learn.

Confidential nature of all work on this project.

Your confidence is requested regarding the nature of your work on this project and the contents of all materials with which you will be working.

The Sorting Task

1. Sorting Materials

   a. You will be given a set of envelopes each containing 20 statements of the kind mentioned above.

b. You will have a set of large boards with 36 pockets on each. You will form groups of statements by putting all those which concern the same aspect of facilitating learning in the same pocket on the sorting board.

2. Sorting Procedures

a. Read and study the first statement in the envelope.

b. Decide what aspect of facilitating learning the statement concerns.

c. Write a tentative statement of this idea on the first index card on the board.

d. File the statement behind the index card.

e. Repeat steps a - d for each statement in the envelope. In the case of each new statement, if it concerns the same aspect of facilitating learning as one which you have previously sorted, put the two together. If not, begin a new group of statements by writing a new tentative title on another index card and filing the statement behind it.

Training Session

The training session will consist of two parts which are described in general terms below.

More detailed instructions will be given by the training instructor.

Part A: You will have a chance to practice making groups of statements which deal with a field other than teaching.

Part B: You will have a chance to look over the type of materials you will actually be grouping and to ask any questions which you may have.

3. What Kind of Groups to Make

a. Kind of groups

If two or more statements concern the same aspect of the teacher's job of facilitating learning, put them together. Most important:

> Groups are to be based on whether or not a sentence concerns a given aspect of facilitating learning, not whether or not the statement reflects a "good" or "bad" practice in your estimation. Therefore, if two statements concern the same aspect of facilitating learning, and you think one is "good" and the other "bad", you still put them in the same group.

b. Level of groups

We want you to make the finest discriminations between any two statements which you feel are valid. We do not want you to make such fine discriminations that you end up with 128 groups, each of one statement, nor do we want you to make such gross discriminations that you have fewer than 10 groups. In the end you must decide whether two statements

concern the same aspect of facilitating learning, or whether two separate groups are called for.

c. Titling groups of statements

The tentative title you make for a group when you file the first statement in it should be a clue to yourself as to what aspect of facilitating learning the statement concerns. This tentative title will be useful to you when deciding whether or not to add statements to the group. During the course of your work you will likely want to change or refine the tentative title. If you cannot change the title by merely inserting or removing words, draw a line through it and write the new title below. Please do not erase any of your tentative titles.

The final title is the one you assign to the group during your final check on groups to see that all statements concern a single aspect of facilitating learning. All tentative titles are for your benefit only. Only the final title need be understandable and clear to an outsider.

d. General comments

1. It is possible that you will find a statement which can logically be put in more than one of your groups. In this case, put it where you think it goes best---that is, file according to what you feel is the most important aspect of the statement.

2. If you come to a statement which is difficult to group, set it aside and come back to it later. However, group all the statements in an envelope before going on to the next envelope.

3. The numbers typed and written on the statements do not mean anything as far as your job is concerned.

e. Checking your groupings (Re-sorting)

1. Minor Re-sort: At any time during the sorting task you may come across a statement which does not belong where you have previously placed it. You may do one of three things with it:

    a. Place it in another group at once.
    b. Start a new group at once.
    c. Mix it in with the other statements in the envelope which have not yet been sorted and sort again when you come to it.

2. Major Re-sort: A major re-sort permits the same shifting of statements and creation of new groups as a minor re-sort, but requires you to review all of the groups you have made. Follow this general procedure:

    a. Look at all the statements in each group. As

you look at these think about whether they "belong together." Remove any statements which you do not think concern the aspect of facilitating learning which is reflected in the title of the group.

b. Regarding those statements removed---either put them into another group on the board, make a new group and give it a tentative title, or put the statements aside to be reconsidered at a later time. As a general rule you should not join all of the statements of two or more groups directly even if they seem very similar.

c. If a group has more than about ten statements in it, think seriously about splitting it into two or more groups unless you are quite sure that all the statements concern the same aspect of facilitating learning.

d. Remember the essence of this work is for you to group statements according to some criteria which seem reasonable to you. We want to remind you not to put statements together unless there is a clear reason in your mind for doing so.

Instructions for Project Staff Conducting Sorting Experiment

1. Welcome the teacher. Put her at ease immediately. Give her the instructions and the ten example statements.

2. Ask the teacher to read "The Aim of the Project." Immediately following, she should read and study the ten example statements. Ask her to give you the central idea of each statement. Give her positive reinforcement for each central idea she gives you. Ask her to continue reading her instructions and to mark any points which are not clear by placing a check in the margin.

3. Discussing the aim of the project.

   Make the following points clear:

   a. We are not evaluating teachers. We are trying to find out something about the reality of elementary teaching---about what teachers do to facilitate learning---not about what makes "good" or "bad" teachers.

   b. Teachers are important to the success of this study. We want to know what teachers must think about and do in order to facilitate learning, therefore we are asking teachers to perform all steps in this research.

   c. The study is a three-step process.

      1) interviews
      2) preparing the statements from the interviews
      3) the sorting of the statements

      These teachers are involved in this third step.

      Your (the teacher's) job as a sorter will be to group the statements according to the actions and beliefs stated in them. Your groups will tell us something about what <u>you</u>, a teacher, think must be done in order to get children to learn.

4. Ask if there are any questions concerning the aim of the project or the confidential nature of the research.

5. Demonstrate the sorting procedure. Show the teacher the sorting board. Using the ten example statements, quickly run through the sorting procedure, mentioning the four steps of:

   a) read-study
   b) decide
   c) write
   d) file

   Do not force the teacher to decide and write at this point.

6. Discuss what kind of groups to make.

Kind of groups

a. Emphasize that when two statements are put together, this means that the actions related in the statements concern the same aspect of facilitating learning and that the idea they have in common is something teachers must think about or do when facilitating learning.

b. Emphasize that they are not to evaluate the actions related in the statements. Therefore, they shouldn't group all the "bad" practices together, nor all the "good" practices together. If two statements concern the same aspect of facilitating learning, and they think one is "good" and the other "bad," they still put them together.

c. Emphasize and reemphasize that they are to group on the basis of same/different not good/bad.

Level of groups

a. Emphasize that we do not know how many of the statements in their envelopes will concern the same aspect of facilitating learning. There may be only one or quite a few.

b. As a general rule, when in doubt as to whether two statements are the same or different, make two groups.

Titling groups

a. Tentative titles are for your convenience and benefits---no need that anyone else should understand them.

b. Final titles, made when you make the final check on your groups, should be understandable and clear for the project staff.

c. Number of words in a title---anywhere from one to ten or thereabouts. Whatever is necessary for you to make a clear statement of the idea which the statements in the group have in common.

d. You may write anything on statements or the sorting board which will be of help to you in doing this sorting task.

General comments

a. Ambiguities: file according to the most important aspect of the statement.

b. Difficult statements: set aside and come back to them when you have finished all other statements in the envelope.

c. Numbers on the slips: mean nothing in terms of your job.

Training: Part A - Merchandising Statements

Say the following to the teachers:

"Now we will practice using the sorting board for grouping statements. We have here some statements about actions which take place in different kinds of stores."

"What criterion should you group on?

1. We want you to assume that you are the manager of some store. We want you to think about what is important in running a store; that is, what you must think about or be concerned with as the store manager.

2. Just as you will later do with statements about teaching, we want you to put together statements which relate to the same concern---this time the same concern in running a store.

3. We know some of the things which we do not want, so we'll tell you them now."

"We do not want:

1. You to put all "good" practices together and all "bad" practices together.

2. You to put all grocery store statements together and all department store statements together. This kind of grouping will not tell us anything about what all store managers must worry about in running a store. (This is comparable to not wanting you to put together all statements concerning 5th grade.) We want to know what concerns are common to all people who run stores. (To all people who teach.)"

Present the teacher with the ten selected pink statements concerning "Customer Satisfaction." These selected statements (some pairs, some single statements) concern:

1) Dealing with "difficult" customers (7,18)
2) Maintaining neat surroundings (5)
3) Giving preferential treatment (9,14,28)
4) Pressuring customers (15,16,24,33)

Ask the teacher to read through these statements and to notice that they are all related to the manager's concern for "Customer Satisfaction."

Ask her if she can see ways in which to make smaller groups of these statements.

If she does not see how this can be done, take the statements from group '1' out of the group and see if she can tell you what they might have in com-

mon. You will probably find it necessary to continue this process with a couple more of the suggested groups, '2', '3', '4'.

After the teacher has grouped the pink statements, give her the white statements and ask her if she can group them. Let her work for 10 minutes or so at this task and then discuss the groups she has made. Accept any rational explanation for her groups.

When you feel that the teacher has grasped the idea of grouping, set her to work on Part B of the training.

Training: Part B

After the teacher has worked with the merchandising statements and you feel that they have served their purpose of getting her to think more flexibly about grouping according to a basic idea, give her the envelope containing the statements from interview 9012. She will no doubt ask you whether or not you think that a certain idea or group is what you're looking for. Try not to answer the question directly, but say something on the line of: "If that idea is one of the things which teachers must be concerned with in facilitating learning, yes, that's a fine group to make." "Fine, if those statements have something in common and you can write a tentative statement of that idea."

In general, the teacher will not want to spend more than ten minutes at this task, possibly only five. There is no set time she must spend, but when she feels ready to begin the sorting task, she may.

Final Steps

1. Leave the instructions with the teacher so she can refer to them if she needs to during the morning.

2. Tell the sorter that she will get statements in envelopes, about 20 at a time, but that all statements are to be grouped together. She is to group statements from one envelope with the statements from previous envelopes or to make new groups.

3. Give sorter final instructions to read the statements and try to sort them sequentially but to set aside difficult statements and come back to them before getting the next envelope.

4. Try to hold off discussion of the re-sort until it is time to do it.

5. Tell the sorter that for her benefit you will glance occasionally at her work for the first envelope. After that you will not bother her. If she appears to be doing something wrong, let her discover her mistake by asking her why she has put certain statements together.

Breaks

Breaks are optional, but should be kept to approximately ten minutes. If the sorter wants a break try to give it to her after she's completed envelope 4 and before the first major re-sort

Re-sort

1. Ask the teacher to make a major re-sort after four envelopes. Limit this

resort to 20 minutes at maximum. They will have another chance for a major resort after all statements are sorted.

2. Be sure the teacher understands the procedure of removing all statements in each group and studying them to see that they all concern the idea stated in the tentative title.

General Rules

a) If there are 10 or more statements in a group, be sure they all concern exactly the idea stated in the title. Think about the possibility of splitting the group.

b) If in doubt---split into two or more groups.

c) If a statement can be placed in an 'old' and a 'new' group, make the 'new' group.

Recording Working Time and Number of Groups

While the teacher is working at the training or the sorting task, record the following information on the record sheet provided.

1. Beginning of training session.
2. Beginning of sorting task.
3. The time when the teacher finishes each envelope.
4. The number of categories on the board upon completion of each envelope.

Recording a Major Re-sort

Record the following for each major re-sort:

1. The number of envelopes completed at the time of re-sort.
2. The time the teacher begins work on the re-sort.
3. The time the teacher finishes the re-sort.

Building a Hierarchy of Final Groups

The result of the complete sorting and re-sorting of all statements is a set of final groups. Now complete the following steps:

1. Staple all statements to index cards.

2. Have the teacher write the group number and title of each final group on a 5" x 8" index card. Spread these cards out on a table.

3. Instruct the sorter to put any two titles (cards) together which he feels "go together." Some success has been had just telling the sorter to "put one with another."
   STAGE 1 consists of pairing as many of the titles of final groups as the teacher wishes. The result is piles of two cards and some not paired.
   As the sorter pairs cards, paper clip them together, record their numbers on the report sheet and remove them so that the teacher is not tempted to change what she has done.

4. Instruct the sorter to put together any two piles of cards which "go together." When she has done this for the piles resulting from stage 1 and can no longer put two piles together, she has completed STAGE 2. As the sorter pairs piles of cards, record the number of the top card in each pile on the report sheet, paper clip piles together, and remove these cards.

5. Keep instructing the sorter to "put one pile with another" through successive stages until she says she can no longer put two groups together. Get her to verbalize the idea which binds together each of the piles of cards as the final two stages---when there are four groups or less.

After the hierarchy is completed, the teacher is finished. Before returning to Madison, check to see that you are returning with all items on the check list.

Merchandising Statements (for use in training sorters)[1]

1. This clerk, who works in a small town grocery store finds that a customer has already gathered a large cart full of groceries, but when coming to the check-out counter has only a fifty-dollar bill which the clerk cannot cash with his ready change. The clerk leaves the customer, saying he'll be back in ten minutes he's going to the bank down the street to get change.

3. This clerk, who sells ladies' hats, tries to service two or more customers at the same time when her department is busy.

5. This clerk will keep a customer waiting while she straightens up her counter and puts things away.

6. This store owner finds that service is better and customers treated better when his clerks don't sell under commission.

7. This clerk, who works in a grocery store, has an older man become obnoxiously loud and indignant when he finds that she does not have a product for which he is looking. She tells him to keep still or please leave the store.

8. This clerk believes you should tell a customer if some piece of clothing doesn't look well on her or him.

9. This clerk will take special care to satisfy a regular customer, even if it involves ignoring other customers.

10. This clerk says to a customer who is trying on a dress that is obviously too small, "That style is not good on you. You can't wear it."

11. This clerk has a special on a certain brand of shoes which he feels are not quite as good as a slightly more expensive brand. He recommends to a customer who is having trouble making up his mind that the more expensive shoes would definitely last longer and thus be better.

14. This clerk in major appliances tries to "size up" his customers and treats those who are obviously 'just looking' curtly so that he may better attend to those who "really want to buy."

15. This clerk believes that it is best to let a customer browse around the department because she will purchase if she finds what she's looking for, or will ask if she can't find it.

16. This clerk believes that it is best to "keep on a customer's back" because you can usually get them to buy something if you try.

17. This clerk, who works in a small grocery store, tries to know all his customers by name.

[1] For use, stencil statements 2 inches apart. Print asterisked statements on white paper and the remainder on pink paper.

18. This clerk, who works in a grocery store, tells a customer to please not lift every head of lettuce in order to make sure that he gets the heaviest one.

21. This clerk, a meat cutter in a supermarket, does not feel that customers are justified in their requests for special cuts of meat because meat is cheaper in a supermarket and if customers want special service they should be willing to pay for that service at a private butcher.

22. This clerk, whenever the store is getting empty, enjoys relating anecdotal stories to his last customers.

24. This owner of a clothing store will not allow a customer to browse through the shirts or trousers by himself; he always insists on showing everything to the customers.

25. This clerk in a tobacco shop will encourage wives to purchase gift certificates for their husbands because he knows that men like to pick out their own pipes or cigars.

27. This clerk, in a woman's store, won't let customers try on numerous shirts or blouses because it means she has to open the wrapping and unpin the blouses and they cannot easily be packaged neatly again.

28. This clerk in a shoe department prefers to have a ticket system so that he is sure of serving customers in the order of their arrival.

31. This grocery store clerk says you must help customers to find exactly what they're looking for even if it involves a good deal of time.

32. This clothing department clerk says customers like special attention and you can sell more if you give it.

33. This clothing store manager finds he can increase sales by using a self-service system.

34. This clothing department manager limits the number of garments which may be taken to a dressing room in order to keep a selection on the racks.

*2. This clerk, working in a large department store, prefers to work under commission because it makes her work harder; she's out to sell more.

*4. This clerk prefers to work in an impersonal department like notions, because she doesn't want to have to criticize a person's taste in clothing.

*12. This clerk does not feel that it is necessary to dress neatly because he sells sporting goods and not men's clothing.

*13. This clerk believes that it is better to be comfortable so she wears flat shoes and not the more stylish high-heeled shoes.

*19. This clerk would rather work in the meat packaging department of the

grocery store than handing out samples of a new meat product or a new drink to customers that come through the aisles.

*20. This clerk, in a grocery store, who finds little boys stealing candy from his shelves, takes them into the back room for his brand of posterior discipline.

*23. This check-out clerk does not feel that it is her duty to tell a customer that he has a broken egg because it will slow up the line.

*26. This clerk in a sporting goods store will encourage a wife to purchase a gift certificate for the gun she wants to give her husband because the certificate will bring the husband in the store and he will be more likely to purchase a higher priced rifle.

*29. This clerk in women's clothing tries to dress stylishly because she feels her appearance has something to do with influencing customers to buy.

*30. This clerk finds that he must work in a busy department because he is easily bored.

Practice Statements

9003.
27. This teacher can tell when children are studying and learning well because they are busy with their own paper and are not interested in what their neighbors are doing.

9003.
38. This teacher does not discipline children by spanking them or shaking them. She appeals to them by telling them they have a good head.

9005.
9. This teacher allows a certain amount of "learning noise" because some noises are necessary for successful completion of an assignment, especially in group work.

9005.
11. This teacher gives the pupil who doesn't seem to be interested in the assigned project something to do that he is interested in because children, like adults, vary in their interests.

9005.
59. This teacher, when she is having trouble establishing rapport with a certain child, will try to find a project that they can work on together.

9005.
63. This teacher says that sometimes you don't know whether a child is learning without testing, but at other times you'll know because he'll say something like "oh, so that's how that goes."

9005.
82. This teacher requires that the children explain the story problems as

they are working them at the board, because this shows her how well they understand what they are doing.

9006.
85. This teacher feels that teachers who work with "larger blocks of time rather than adhering to a rigid schedule, can be more flexible.

9006.
120. This teacher, if she has time at the end of the social studies lesson, will present the problem to be taken up at the next day's lesson, but she does this only if time permits.

9006.
126. This teacher keeps a file of representative samples of the work of each student. This file serves as a kind of record of student progress.

9007.
3. This teacher learns the children's name first thing in the morning on the first day of school by having the children stand as she reads their names from a list because this gives her a chance to associate the name and face.

9007.
14. This teacher works with one reading group at a time at the front of the room, and the others work at their desks.

9007.
29. This teacher says that, when she has the interest of the children, there is no problem about discipline.

9007.
61. This teacher has conferences with the children in which she might confront a student whose work is not neat, show him a neat paper and ask him if he couldn't do better.

9007.
97. This teacher says that sometimes she has composition work which comes directly from a story that the children are reading.

9007.
118. This teacher had each child make a map of Mexico, so that he would learn the concept of where the country was located and where the major cities were.

9007.
137. This teacher feels that she has a good atmosphere in her classroom because the children perceive that she enjoys teaching and children.

9008.
117. This teacher believes that it is possible to correlate art and music with other subjects if you plan ahead and consult with the special teachers.

9008.
1[illegible]. This teacher, who completes a lesson on the deer population in Wisconsin

as part of a conservation project, assigns a story to be written on deer as part of the next day's language lesson because she tries to correlate and integrate all her subjects.

9009.
25. This teacher selects one story for all the children to read the first day because she doesn't want the children to be conscious of what reading group they will be in later on.

9009.
37. This teacher says that the first thing in the morning is a good time to talk over things which need some attention because the children are concentrating at this time and they are not concentrating before recess or before lunch.

9009.
47. This teacher suggests using the 10 or 15 minutes after lunch and before a scheduled gym class for a story or other activity which will relax the children and get them ready for the routine.

9009.
104. This teacher feels that it is a sign of good teaching when a teacher can correct a child in the same tone as the rest of the conversation and get a response from that child because she has reached a point where correction does not disrupt the class.

9009.
108. This teacher feels that a good discussion is important because it helps the teacher know how much has been learned and understood, and also because it helps the child learn to express himself and to listen to others.

9009.
109. This teacher doesn't repeat instructions after they have been carefully given because children need to learn to pay attention and the teacher needs to break the habit of repeating continuously.

9009.
134. This teacher, so that she can move on to oral work with the next reading group, gives a reading group questions about their story which require a little extra digging on their part. She might ask them to compare the characters, home life, or education of two of the people they have been reading about. The children's answers are written.

9009.
145. This teacher rephrases the questions which are asked about information on the social studies sheet because she feels it is important that they should learn to interpret questions and be able to come up with the correct answer even though a question is stated differently.

9010.
19. This teacher does not try to seat the children the first day, but lets them sit where they want to because she feels she does not know the children well enough yet.

9010.
30. This teacher believes that games might inspire some children to learn, especially low groups.

9010.
52. This teacher says that when the class has a low average score on a test it sometimes indicates that they have forgotten the material because it has not been sufficiently stressed.

9010.
69. This teacher feels that sometimes you have to repeat lessons many times to get an idea across.

9011.
25. This teacher goes right into the subject matter during the first full week of school.

9011.
43. This teacher sees lack of attention toward the class activity as a good indication of poor teaching or learning.

9011.
123. This teacher has made out her own unit for teaching grammar, using ditto sheets to supplement other material because she feels that a more thorough study is needed than is offered by the text.

Check List of Materials for Sorting Experiments

___1. Two practice boards per teacher
___2. Two sorting boards per teacher
___3. Envelope containing merchandizing statements for each teacher
___4. Envelope containing first ten statements for each teacher
___5. Envelope containing practice statements for each teacher
___6. Envelopes containing sorting statements for each teacher
___7. "Instructions for Teachers Acting as Sorters" for each teacher
___8. "Teacher's Information Sheet" for each teacher
___9. "Category and Working Time Report" for each teacher
__10. "Hierarchy Report" for each teacher
__11 .* "Instructions for Project Staff for Conducting Sorting Experiments"
__12.* Copy (intact) of merchandizing statements for instructor
__13.* Pencils (sharpened)
__14.* Stapler and staples
__15.* 4 x 6 lined index cards
__16.* Paper clips and rubber bands
__17. Reading material

Prepare before leaving Madison: 1. Sorting boards (put sorter's code number on each board).

2. Envelope containing statements to be sorted.

3. Inventories (enough for each teacher plus 5 or so) if inventory to be given.

During the day: Record the working time and number of groups for each sorter.

Before returning to Madison: 1. Check to be sure that all statements are stapled securely to the sorting board.

2. Check to be sure that you are returning to Madison with all items on the check list.

---

* It is recommended that these materials be kept stored in a file box for 5 x 6 inch index cards.

Date_____

SORTER'S INFORMATION SHEET

Name_____ Sorter Code Number_____

Address_____ Telephone_____

Teaching Experience

Number of years full time_____

Number of years substituting_____

Grade level(s)_____

Your answers to the following questions will be appreciated by those of us working on this research project. They will be valuable in helping us to utilize the information from interviews with teachers more efficiently and thoroughly. Please feel free to make any comments not specifically called for by these questions on the back of this sheet.

1. Do you have any criticisms or comments to make regarding the method of sorting the statements? For example, do you think there might be some changes called for in the sorting board, the statements themselves, or the report sheets you have filled out?

   Sorting boards:

   Statement:

   Report sheets:

   Other:

2. Do you have any criticisms or comments to make concerning the training session and its effectiveness in preparing you for the job of sorting?

3. Would you be willing to help with the research in similar ways in the future?

CATEGORY AND TIME REPORT

Sorter Code Number_____
City_____
Date_____

MEETING TIME_____
START OF TRAINING_____
START OF 1ST PACKET_____

Envelope Number	Time Finished	Total Number of Groups
1	_____	_____
2	_____	_____
3	_____	_____
4	_____	_____
MAJOR RE-SORT		
5	_____	_____
6	_____	_____
MAJOR RE-SORT	_____	_____

HIERARCHY: Time begun_____ Time finished_____

BREAKS

1 for_____ minutes at _____o'clock

2 for_____ minutes at_____o'clock

3 for_____ minutes at_____o'clock

4 for_____ minutes at_____o'clock

REPORT OF HIERARCHY

Sorter Code No._____
City_____
Date_____

Starting time_____

Finished_____

Page No. 1

(Continue recording hierarchy on additional blank sheets. Staple all sheets together with this form on top.)

Follow this format.

Stage 1 (e.g.)

__90__ with __10__

__39__ with _____

Stage 2

__90__ with __67__

__39__ with _____

APPENDIX G

LATENT PARTITION ANALYSIS

The model for latent partition analysis arose as a result of a study in which each of a number of elementary school teachers were given the same set of items and were asked to sort the items into what they considered homogeneous categories. The items were statements which had been made by interviewed teachers and described teaching-learning behavior. Each sorter constructed different categories, but similarities between categorizations were apparent.

These apparent similarities led us to formulate a model for relating the manifest categorizations of a group of sorters to a hypothetical latent categorization of the items. A formal description of the latent partition analysis model follows.

A partition of a set of items is a division of the set into disjoint, exhaustive categories. The data for latent partition analysis is a sequence of different partitions of the same set of items, and the basic structural hypothesis is that there is a latent partition which underlies the manifest partitions. The items are assumed to be assigned to manifest categories according to independent, discrete probability distributions. The distributions are assumed to be identical, within a given manifest partition, for items from a given latent category, but otherwise to vary across items and across manifest partitions.

We shall say that there are N agents of partitioning, designated by the subscript i, each of whom provides one manifest partition of K items. There are L categories in the latent partition, and M_i categories in the manifest partition of agent i. For the purposes of this report the agents of partitioning are fixed.

i = agents (partitions) 1, 2, ..., N;
j,k = items 1, 2, ..., K;
m,n = manifest categories 1, 2, ..., M_i;
μ,ν = latent categories 1, 2, ..., L.

Manifest partition i is represented by an M_i by K matrix Z_i with rows corresponding to categories and columns corresponding to items. The (m,j)th entry is 1 if item j is included in category m, and 0 otherwise. Note that there is exactly one entry of 1 in each column, since an item is included in exactly one category, and that the row sums give the numbers of items in the categories.

An example of representation of a manifest partition is the following:

$$Z = \begin{bmatrix} 1 & 1 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 & 1 \end{bmatrix}$$

where the number of items, K, is equal to eight; and the number of manifest categories, M_i is equal to four.

The entries in the above matrix imply that manifest category one consists of items one, two and three; manifest category two consists of items four and five; manifest category three consists of item six; and manifest category four consists of items seven and eight.

The latent partition is represented by an L by K matrix Φ which has the formal structure as the Z_i. It should be noted that Φ is assumed constant for all agents of partitioning and that the entries in Φ indicate the category of the latent partitioning to which a particular item belongs.

The probabilities which relate manifest partition i to the latent partition are represented as the entries of an M_i by L matrix Π_i with rows corresponding to the categories of manifest partition i and columns corresponding to the latent categories. The (m,μ) th entry of Π_i is the probability with which any item from latent category μ is included in manifest category m of partition i. Note that the columns of Π_i sum to unity. The matrix Π_i is taken as constant over independent partitionings of items for any given agent of partitioning.

An example of such a probability transformation matrix is the following:

$$\Pi_i = \begin{bmatrix} 3/4 & 0 & 1/4 \\ 1/4 & 0 & 1/4 \\ 0 & 1/2 & 1/4 \\ 0 & 1/2 & 1/4 \end{bmatrix}$$

The entries in this matrix imply that there are three latent categories. In addition, items in latent category one will appear in manifest categories one and two with probabilities 3/4 and 1/4 respectively. Items in latent category two will appear in manifest categories three and four with probability 1/2 in each. Items in latent category three will appear in each manifest category with equal probability.

We can show that

$$(1) \qquad E(Z_i) = \Pi_i \Phi$$

where the expection is over the transformations of Φ into the sample space of all possible partitions of the K items, the probability distribution of the partitions being determined by Π_i. That is, the expectation is conditioned on the agent of partitioning. The distribution for each item is assumed multinomial with probabilities determined by the column of Π_i corresponding to the latent category to which the item belongs. The assignments are assumed to be mutually independent.

The following is a proof. The expected value of the (m, j) th entry of Z_i is the probability of inclusion of item j in manifest category m, since the entry is 1 or 0, as the item is or is not included in the category. Suppose that item j is in latent category μ. Then the probability of inclusion of the item in manifest category m is just the (m, μ) th entry of Π_i; also, the μth entry of the jth column of Φ is 1 and the other entries are 0. So in multiplying the mth row of Π_i by the jth column of Φ, the (m,μ) th entry of Π_i is

obtained, and that is the desired probability of inclusion. Therefore, the entries in the matrix product $\Pi_i \Phi$ are the expectations of the entries of Z_i, and the result is established.

The Joint Occurence Matrix

The K x K matrix defined by

$$S_i = Z_i' Z_i \tag{2}$$

is a matrix of item joint occurence--that is, occurence in the same manifest category. The (j,k) th entry of S_i is the inner product of the jth and kth columns of Z_i. Both columns have exactly one entry of 1; if these entries are in the same row (for the same category), then the (j, k) th entry of S_i is 1, and otherwise it is 0. So the entry of S_i is 1 or 0 as items j and k are or are not in the same category of partition i. The diagonal entries of S_i are identically 1. We want to find the expectation, written Σ_i, of S_i.

Clearly, the entries of Σ_i are the probabilities of joint occurrence of the pairs of items. These probabilities are constant across distinct items from a given pair of latent categories, which motivates defining the L x L matrix

$$\Omega_i = \Pi_i' \Pi_i . \tag{3}$$

The (μ,ν) th entry of Ω_i is (even when $\mu = \nu$) the probability of joint occurence of any pair of distinct items from latent categories μ and ν. This is true since the entry is the inner product of the μ th and ν th columns of Π_i, which is the sum of the products of the probabilities of inclusion in the manifest categories. And since the items are independently categorized, that sum is the probability of joint occurence.

Consider the K x K matrix $\Phi'\Omega_i\Phi$. Its (j,k) th entry is equal to the entry in Ω_i corresponding to the latent category pair of which items j and k are members. This is true since the (j,k) th entry in $\Phi'\Omega_i\Phi$ is the product of the jth row of Φ' by Ω_i by the kth column of Φ; the single entry of 1 in the row of Φ' selects the row in Ω_i corresponding to the latent category of item j, and the single entry of 1 in the column of Φ selects the column of Ω_i corresponding to the latent category of item k.

The off-diagonal entries of $\Phi'\Omega_i\Phi$ are equal to those of Σ_i, since they are the desired probabilities of joint occurence. Therefore, the K x K matrix

$$\Delta_i^2 = \Sigma_i - \Phi'\Omega_i\Phi \tag{4}$$

is diagonal, and, in fact, its diagonal entries are the complements of the diagonal entries of $\Phi'\Omega_i\Phi$. This is true because the diagonal entries of Σ_i are identically 1, since the diagonal entries in S_i are identically 1. The jth diagonal entry of Δ_i^2, called the diversity of item j, can be shown to be the probability of the item's being included in two different categories under independent repartition, given the constant probability transformation matrix Π_i. The diversities are constant across the items of a given latent category.

Now from equation (4), we have o representation of the expectation of S_i :

$$(5) \qquad E(S_i) = \Sigma_i = \phi' \Omega_i \phi + \Delta_i^2,$$

where, again, the expectation is conditional on the agent of partitioning.

The Joint Proportion Matrix

A joint occurence matrix, S_i, is defined for each manifest partition. Now the K x K joint proportion matrix S is defined as

$$(6) \qquad S = N^{-1} \sum S_i \quad .$$

(Here and in the following equations, the summation is over partitions, i=1, 2, ..., N.) The (j,k) th entry of S is the proportion of partitions in which items j ond k are included in the same category. We wont to derive the expectation, written Σ, of S. At this point, we recoll that the agents of partitioning are considered fixed.

$$(7) \qquad E(S) = \Sigma = E(N^{-1} \sum S_i) \, .$$

The expectation is taken inside the summation:

$$(8) \qquad \Sigma = N^{-1} \sum E(S_i) = N^{-1} \sum \Sigma_i \, .$$

The representation of Σ_i given in equation (5) is substituted:

$$(9) \qquad \Sigma = N^{-1} \sum (\phi' \Omega_i \phi + \Delta_i^2) = N^{-1} \sum \phi' \Omega_i \phi + N^{-1} \sum \Delta_i^2 \quad .$$

The matrices ϕ' and ϕ are constant across the summation and are taken outside:

$$(10) \qquad \Sigma = \phi' (N^{-1} \sum \Omega_i) \phi + N^{-1} \sum \Delta_i^2 \quad .$$

Finally, we define averages for ihs parameters Ω_i and Δ_i^2 :

$$(11) \qquad \Omega = N^{-1} \sum \Omega_i \text{ and}$$

$$(12) \qquad \Delta^2 = N^{-1} \sum \Delta_i^2,$$

and substitute them into equation (10). The final representation of the expectation of S is

$$(13) \qquad \Sigma = \phi' \Omega \phi + \Delta^2 \, .$$

Reconstruction of Φ and Ω

Suppose that we know Σ and Δ^2. Then a latent root and vector decomposition is performed:

$$(14) \qquad \Sigma - \Delta^2 = \Gamma \Lambda^2 \Gamma',$$

where Λ^2 is the diagonal matrix of latent roots of $\Sigma - \Delta^2$, and the columns of the orthonormal matrix Γ are the corresponding latent vectors. By equations (13) and (14),

$$(15) \qquad \Sigma - \Delta^2 = \Gamma \Lambda^2 \Gamma' = \Phi' \Omega \Phi .$$

Note that the rank of these matrices is L, the number of latent categories.

The matrix Φ' has independent cluster structure; that is, it has exactly one non-zero entry in each row. So we may apply a theorem of Harris and Kaiser [1] and assert that there exists an orthonormal matrix Θ and a positive definite diagonal matrix Ψ such that

$$(16) \qquad \Phi' = \Gamma \Theta \Psi \text{ and}$$

$$(17) \qquad \Omega = \Psi^{-1} \Theta' \Lambda^2 \Theta \Psi^{-1}.$$

Harris and Kaiser also state that $\Gamma\Theta$ may be produced by applying the raw quartimax rotation procedure to Γ.

The raw quartimax procedure is a sufficient one for this purpose since the raw quartimax criterion value is maximized when $\Gamma\Theta$ has independent cluster structure. This is true since the row sums of squares of $\Gamma\Theta$ are constant for orthonormal Θ and the sums of fourth powers (the quartimax criterion) are maximized separately for each row when there is only one non-zero entry in the row. This fact is not available in the literature and was first noted by Charles Wrigley.

In equation (16), the matrix Ψ merely scales the columns of $\Gamma\Theta$, which implies that the columns of $\Gamma\Theta$ are proportional to those of Φ'. Since the rows of Φ' each have one entry of one with the rest zero, the row sums of Φ' are each 1, i.e. $\Phi' \underline{1} = \underline{1}$, where $\underline{1}$ is a vector of ones. Therefore, a least squares solution for Ψ results from the equation $\Gamma\Theta\underline{\psi} = \underline{1}$, where $\underline{\psi} = \Psi \underline{1}$.

This produces the estimate $\hat{\underline{\psi}} = \Theta' \Gamma' \underline{1}$. Therefore,

$$(18) \qquad \hat{\Psi} = \text{diag}\,(\hat{\Psi}\underline{1}) = \text{diag}\,(\hat{\underline{\psi}}) = \text{diag}\,(\Theta' \Gamma' \underline{1}),$$

the column sums of $\Gamma\Theta\Psi$, and $\hat{\Psi}^2$ forms the diagonal matrix of latent category frequencies. Note that diag $(\underline{\beta})$ forms a diagonal matrix with the elements of the vector $\underline{\beta}$ in the diagonal.

COMPUTATION*

(In collaboration with Richard G. Wolfe)

In practice Σ is not known, and S must be used as an estimate of it. Since the partitions are independent, the law of large numbers implies that the difference between Σ and S is small when there is a large number, N, of partitions.

We propose the following computing algorithm for estimating the average diversities, Δ^2. Applications with real data have indicated that the procedure converges and produces proper results.

Step 1. Compute the latent roots and vectors of S. Set $\hat{L}$, the estimate of the number of latent categories, equal to the number of roots which are greater than or equal to 1. Take a diagonal matrix of complements of the largest values in a column of S as a first approximation to $\hat{\Delta}^2$.

Step 2 (iterative). At each stage in the iteration, compute $S - \tilde{\Delta}^2$, where $\tilde{\Delta}^2$ is the approximation from the previous stage, and its $\hat{L}$ largest roots and corresponding vectors. Then reproduce (imperfectly) $S - \tilde{\Delta}^2$ with those roots and vectors, and take the complement of the diagonal of the reproduced matrix as the new approximation to $\tilde{\Delta}^2$.

When the iteration is terminated, the last approximation becomes the estimate $\hat{\Delta}^2$, and the obtained roots and vectors become the estimates $\hat{\Lambda}^2$ and $\hat{\Gamma}$.

Step 3. Compute the latent roots and vectors of $S - \hat{\Delta}^2$; they are estimates, $\hat{\Gamma}$ and $\hat{\Lambda}^2$, to the matrices in equation (14). Select the $\hat{L}$ largest roots and corresponding vectors, and compute $\hat{\Theta}$ by performing raw quartimax rotation on $\hat{\Gamma}$. Compute $\hat{\Psi}$ as the diagonal matrix of column sums of $\hat{\Gamma}\hat{\Theta}$.

The outputs are $\hat{\Phi}' = \hat{\Gamma}\hat{\Theta}\hat{\Psi}$ and $\hat{\Omega} = \hat{\Psi}^{-1}\hat{\Theta}'\hat{\Lambda}^2\hat{\Theta}\hat{\Psi}^{-1}$.

An Example

Each of 127 elementary school teachers and trainees were given a deck of 50 punch cards on which were printed verbs which describe things that elementary school teachers do. Their instructions were to sort the cards into categories so that they considered the verbs in a given category similar in the way in which they facilitated learning. The teachers were instructed not to categorize with respect to "goodness" or "badness" of the verbs. The procedures were restricted so that a mutually exclusive and exhaustive categorization of the verbs resulted for each sorter.

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* Data design and collection and computational work related to the development and application of Latent Partition Analysis were conducted by Donald M. Miller and Richard G. Wolfe at the Instructional Research Laboratory and Computing Center of the University of Wisconsin; with computer work supported through the University Research Committee by the National Science Foundation and the Wisconsin Alumni Research Foundation.

In the following tables the numbers are given to two decimal places. The S. matrix resulting from the study is given in Table 1.

There were ten latent roots of the S matrix which exceeded one. The iteration procedure produced diversity estimates in which the discrepancy between the estimates in the last two stages was less than 0.002. The iterations were terminated after 11 stages. After iteration the final values of the ten largest latent roots were:

10.22, 5.78, 3.82, 3.04, 2.93, 1.52, 1.03, 0.87, 0.71, 0.69.

The difference between the tenth and eleventh roots was 0.22 which was twice as large as any later difference. The sum of squares of the discrepancies between the off diagonal elements of the reproduced and the actual S matrix was the following for successive iterations:

0.4927, 0.4727, 0.4722, 0.4721, 0.4720, 0.4720, 0.4719.

After the seventh iteration the value remained at 0.4719.

The estimated Ψ' matrix, bordered by the estimated values of the elements of $1-\hat{\Delta}^2$ for each item and the elements of $\hat{\Upsilon}^2$ for each latent category is given in Table 2. It should be noted that some of the entries in the estimated Ψ' matrix do not conform to the assumed independent cluster. We are currently studying this toward the end of improving the model.

The estimated Ω matrix is given in Table 3.

REFERENCE

[1] Harris, Chester W. and Kaiser, Henry F. Oblique factor analytic solutions by orthogonal transformations. Psychometrika, 1964, 29, 347-362.

		1	2	3	4	5	6	7	8	9	10	11	1
1.	Advises	100	18	13	19	26	28	32	17	37	11	16	2
2.	Answers	18	100	16	24	43	11	33	7	24	7	33	3
3.	Arranges	13	16	100	42	12	3	9	13	8	7	17	1
4.	Assigns	19	24	42	100	17	1	11	19	14	16	20	2
5.	Clarifies	26	43	12	17	100	13	33	3	23	4	49	5
6.	Commends	28	11	3	1	13	100	39	14	34	13	10	1
7.	Confirms	32	33	9	11	33	39	100	14	38	15	17	1
8.	Controls	17	7	13	19	3	14	14	100	20	58	3	
9.	Convinces	37	24	8	14	23	34	38	20	100	20	15	1
10.	Demands	11	7	7	16	4	13	15	58	20	100	3	
11.	Demonstrates	16	33	12	20	49	10	17	3	15	3	100	5
12.	Discusses	24	35	12	22	52	17	19	2	17	4	57	10
13.	Displays	15	20	17	22	37	16	14	4	15	3	72	4
14.	Drills	13	29	8	36	23	3	19	13	14	17	21	2
15.	Encourage	33	10	3	2	17	62	31	7	43	9	15	2
16.	Enforces	17	8	6	11	9	18	20	57	23	58	6	
17.	Evaluates	12	27	10	14	14	9	13	5	6	5	12	1
18.	Exemplifies	20	26	11	15	46	19	25	9	23	6	50	4
19.	Explains	26	46	17	24	63	8	26	6	19	5	58	5
20.	Grades	3	27	14	16	2	7	12	9	6	7	3	
21.	Illustrates	17	31	13	21	49	11	19	3	13	4	60	5
22.	Impels	13	9	6	12	6	21	17	49	27	74	6	
23.	Inspires	30	12	6	6	19	49	24	4	33	6	21	2
24.	Interprets	23	45	16	20	53	11	34	9	23	6	41	4
25.	Introduces	20	28	24	31	36	13	14	4	15	2	52	4
26.	Judges	9	24	9	12	9	10	13	15	8	13	7	
27.	Lectures	16	31	20	40	30	3	17	17	20	14	47	4
28.	Organizes	17	9	77	35	17	7	8	12	8	3	13	1
29.	Penalizes	6	5	5	8	0	17	10	60	14	69	1	
30.	Permits	31	8	6	7	9	41	23	42	33	27	9	1
31.	Persuades	40	17	8	9	17	42	31	24	63	24	13	1
32.	Plans	13	11	79	35	12	6	6	9	4	3	9	1
33.	Questions	17	43	11	18	30	17	20	2	15	2	28	4
34.	Reasons	31	27	10	13	40	25	33	13	39	13	24	3
35.	Regulates	23	10	22	26	7	7	16	69	20	46	2	
36.	Reinforces	24	24	4	11	36	35	38	5	19	10	23	2
37.	Reminds	28	22	7	13	21	20	26	26	31	28	12	1
38.	Repeats	18	35	15	25	46	8	29	11	20	13	31	3
39.	Reprimands	7	5	5	8	0	17	11	63	14	66	1	
40.	Restricts	9	5	6	13	0	13	13	71	16	72	1	
41.	Reviews	13	33	12	19	37	11	20	5	14	9	27	2
42.	Rewards	24	13	4	2	9	67	31	18	24	18	13	1
43.	Schedules	14	13	79	43	8	2	6	15	7	6	7	
44.	Simplifies	20	39	19	18	68	9	25	2	18	5	49	4
45.	Stimulates	29	11	7	8	22	45	24	5	35	6	24	2
46.	Supervises	41	17	25	27	17	16	20	31	14	16	16	2
47.	Tests	6	30	13	20	6	7	11	7	6	9	7	
48.	Threatens	6	5	4	7	0	15	9	58	13	72	1	
49.	Tutors	31	22	16	34	31	9	21	13	17	11	26	2
50.	Urges	38	13	6	8	14	48	29	17	57	20	14	2

* The entries in this table were multiplied by 100.

TABLE I*

The S-Matrix

11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
6	24	15	13	33	17	12	20	26	3	17	13	30	23	20	9	16	17	6	31	40	13	17	31	23	24	28	18	7	9	13	24	14	20	29	41	6	6	31	38
13	35	20	29	10	8	27	26	46	27	31	9	12	45	28	24	31	9	5	8	17	11	43	27	10	24	22	35	5	5	33	13	13	39	11	17	30	5	22	13
17	12	17	8	3	6	10	11	17	14	13	6	6	16	24	9	20	77	5	6	8	79	11	10	22	4	7	15	5	6	12	4	79	19	7	25	13	4	16	6
20	22	22	36	2	11	14	15	24	16	21	12	6	20	31	12	40	35	8	7	9	35	18	13	26	11	13	25	8	13	19	2	43	18	8	27	20	7	34	8
49	52	37	23	17	9	14	46	63	2	49	6	19	53	36	9	30	17	0	9	17	12	30	40	7	36	21	46	0	0	37	9	8	68	22	17	6	0	31	14
10	17	16	3	62	18	9	19	8	7	11	21	49	11	13	10	3	7	17	41	42	6	17	25	7	35	20	8	17	13	11	67	2	9	45	16	7	15	9	48
17	19	14	39	31	20	13	25	26	12	19	17	24	34	14	13	17	8	10	23	31	6	20	33	16	38	26	29	11	13	20	31	6	25	24	20	11	9	21	29
3	2	4	13	7	57	5	9	6	9	3	49	4	9	4	15	17	12	60	42	24	9	2	13	69	5	26	11	63	71	5	18	15	2	5	31	7	58	13	17
15	17	15	14	43	23	6	23	19	6	13	27	33	23	15	8	20	8	14	33	63	4	15	39	20	19	31	20	14	16	14	24	7	18	35	14	6	13	17	57
3	4	3	17	9	58	5	6	5	7	4	74	6	6	2	13	14	3	69	27	24	3	2	13	46	10	28	13	66	72	9	18	6	5	6	16	9	72	11	20
100	57	72	21	15	6	12	50	58	3	80	6	21	41	52	7	47	13	1	9	13	9	28	24	2	23	12	31	1	1	27	13	7	49	24	16	7	1	26	14
57	100	46	21	20	6	14	42	54	2	58	8	28	40	49	9	40	12	1	17	18	10	45	37	5	28	16	32	2	1	28	14	8	46	28	21	5	1	28	21
72	46	100	22	17	6	11	50	39	6	69	9	27	30	47	9	35	18	2	13	12	15	22	22	2	22	9	22	2	3	26	13	10	39	28	11	9	2	20	11
21	21	22	100	2	17	15	19	24	24	24	15	2	22	16	21	35	9	10	5	9	7	24	13	13	32	26	51	9	12	53	9	11	23	4	11	30	10	35	6
15	20	17	2	100	13	7	20	13	4	17	20	69	12	22	6	6	7	7	34	49	5	14	26	8	34	22	8	7	6	9	53	2	9	63	13	3	8	11	65
6	6	6	17	13	100	3	10	10	6	6	53	9	6	2	16	13	5	61	34	27	4	6	17	47	22	28	17	65	61	11	24	6	6	9	18	7	59	11	18
12	14	11	15	7	3	100	10	11	73	12	4	8	24	13	72	9	10	2	9	6	13	35	14	9	14	7	11	2	2	21	15	12	11	7	14	75	2	10	5
50	42	50	19	20	10	10	100	49	3	58	9	28	36	32	8	31	12	5	16	20	8	21	29	10	18	16	34	5	6	26	13	8	42	27	15	5	4	20	19
58	54	39	24	13	10	11	49	100	3	58	6	18	53	42	8	44	13	2	9	14	10	31	32	9	23	24	43	3	2	29	10	10	59	19	17	6	2	31	18
3	2	6	24	4	6	73	3	3	100	2	8	2	24	5	74	12	10	8	3	6	15	29	7	12	12	6	10	7	7	21	16	19	2	1	13	83	7	10	4
80	58	69	24	17	6	12	58	58	2	100	4	20	37	48	7	44	14	1	10	9	13	32	25	3	24	15	35	1	1	32	12	9	49	22	16	7	1	27	9
6	8	9	15	20	53	4	9	6	8	4	100	19	8	7	13	15	2	61	31	34	3	6	15	37	13	29	12	59	62	7	24	5	6	17	14	6	63	9	30
21	28	27	2	69	9	8	28	18	2	20	19	100	17	39	3	9	9	2	26	39	7	19	22	5	28	14	8	2	2	8	39	5	17	87	13	2	2	12	53
41	40	30	22	12	6	24	36	53	24	37	8	17	100	27	23	32	12	3	11	16	10	28	30	12	22	18	31	3	4	29	11	12	48	18	18	23	3	27	16
52	49	47	16	22	2	13	32	42	5	48	7	39	27	100	6	42	24	0	11	15	24	31	20	6	20	9	26	0	1	25	10	21	35	38	21	9	0	26	17
7	9	9	21	6	16	72	8	8	74	7	13	3	23	6	100	13	6	13	11	7	7	28	13	14	13	9	11	13	15	21	20	9	6	4	11	74	13	11	6
47	40	35	35	6	13	9	31	44	12	44	15	9	32	42	13	100	17	13	8	13	13	23	19	15	12	15	31	12	14	24	5	17	31	13	21	10	13	37	9
13	12	18	9	7	5	10	12	13	10	14	2	9	12	24	6	17	100	1	9	5	88	9	13	20	8	4	13	2	4	12	5	83	17	10	28	8	1	19	5
1	1	2	10	7	61	2	5	2	8	1	61	2	3	0	13	13	1	100	29	17	2	2	7	43	5	24	8	94	83	5	23	3	2	2	15	6	92	6	11
9	17	13	5	34	34	9	16	9	3	10	31	26	11	11	11	8	9	29	100	41	7	17	25	34	17	28	7	31	37	12	40	4	9	27	28	6	28	13	39
13	18	12	9	49	27	6	20	14	6	9	34	39	16	15	7	13	5	17	41	100	4	14	35	21	20	37	16	17	17	12	30	6	11	39	14	6	17	13	65
9	10	15	7	5	4	13	8	10	15	13	3	7	10	24	7	13	88	2	7	4	100	11	11	17	9	6	10	2	2	12	4	86	16	8	26	13	2	14	2
28	45	22	24	14	6	35	21	31	29	32	6	19	28	31	28	23	9	2	17	14	11	100	28	5	21	12	24	2	1	35	16	9	27	19	16	33	2	17	15
24	37	22	13	26	17	14	29	32	7	25	15	22	30	20	13	19	13	7	25	35	11	28	100	13	25	24	20	9	9	19	17	9	32	24	17	9	7	22	31
2	5	2	13	8	47	9	10	9	12	3	37	5	12	6	14	15	20	43	34	21	17	5	13	100	5	22	13	45	51	4	9	24	6	6	33	11	41	17	15
23	28	22	32	34	22	14	18	23	12	24	13	28	22	20	13	12	8	5	17	20	9	24	25	5	100	31	40	5	4	39	34	6	31	31	17	13	6	24	24
12	16	9	26	22	28	7	16	24	6	15	29	14	18	9	9	15	4	24	29	37	6	12	24	22	31	100	42	26	25	29	23	6	23	14	19	7	25	18	30
31	32	22	51	8	17	11	34	43	10	35	12	8	31	26	11	31	13	8	7	16	10	24	20	13	40	42	100	7	9	57	9	13	44	11	16	13	8	32	13
1	2	2	9	7	65	2	5	3	7	1	59	2	3	0	13	12	2	94	31	17	2	2	9	45	5	26	7	100	81	6	22	3	1	2	17	6	91	6	12
1	1	3	12	6	61	2	6	2	7	1	62	2	4	1	15	14	4	83	37	17	2	1	9	51	4	25	9	81	100	4	17	6	1	3	18	6	80	9	13
27	28	26	53	9	11	21	26	29	21	32	7	8	29	25	21	24	12	5	12	12	82	35	19	4	39	29	57	6	4	100	13	11	35	9	13	28	6	28	9
13	14	13	9	53	24	15	13	10	16	12	24	39	11	10	20	5	5	23	40	30	4	16	17	9	34	23	9	22	17	13	100	2	8	36	13	15	20	6	39
7	8	10	11	2	6	12	8	10	19	9	5	5	12	21	9	17	83	3	4	6	86	9	9	24	6	6	13	3	6	11	2	100	11	5	24	15	2	17	4
49	46	39	23	9	6	11	42	59	2	49	6	17	48	35	6	31	17	2	9	11	16	27	32	6	31	23	44	1	1	35	8	11	100	20	19	5	2	32	10
24	28	28	4	63	9	7	27	19	1	22	17	87	18	38	4	13	10	2	27	39	8	19	24	6	31	14	11	2	3	9	36	5	20	100	13	2	2	14	49
16	21	11	11	13	18	14	15	17	13	16	14	13	18	21	11	21	28	15	28	14	26	16	17	33	17	19	16	17	18	13	13	24	19	13	100	10	13	30	15
7	5	9	30	3	7	75	5	6	83	7	6	2	23	9	74	10	8	6	6	6	13	33	9	11	13	7	13	6	6	28	15	15	5	2	10	100	6	13	4
1	1	2	10	8	59	2	4	2	7	1	63	2	3	0	13	13	1	92	28	17	2	2	7	41	6	25	8	91	80	6	20	2	2	2	13	6	100	5	11
26	28	20	35	11	11	10	20	31	10	27	9	12	27	26	11	37	19	6	13	13	14	17	22	17	24	18	32	6	9	28	6	17	32	14	30	13	5	100	11
14	21	11	6	65	13	5	19	18	4	9	30	53	16	17	6	9	5	11	39	65	2	15	31	15	24	30	13	12	13	9	39	4	10	49	15	4	11	11	100

TABLE 2*

The $\hat{\phi}'$ - Matrix

	Verb	Δ^2	Latent Category									
			1	2	3	4	5	6	7	8	9	10
25	introduces	.48	49	-4	46	10	1	9	18	4	-20	-10
27	lectures	.42	50	1	8	-2	3	32	35	-8	-34	14
18	exemplifies	.41	53	2	-1	-2	-4	-7	0	36	5	11
13	displays	.62	109	1	-1	5	1	4	-10	-23	10	0
21	illustrates	.80	111	-1	-14	-3	-4	3	-3	7	10	-5
11	demonstrates	.80	113	1	-8	-3	-1	-7	-7	7	1	4
16	enforces	.52	-3	58	-7	-4	-4	13	34	1	12	4
22	impels	.57	2	72	13	0	1	12	-13	-10	-10	35
10	demands	.66	-3	79	5	-1	0	17	5	-8	-13	20
40	restricts	.80	1	85	1	-4	0	-3	35	-6	-4	-5
39	reprimands	.87	1	100	-1	1	0	-8	1	8	8	-12
29	penalizes	.88	1	104	2	2	1	-5	-9	8	5	-11
48	threatens	.87	-0	106	3	3	0	-2	-19	8	2	-6
15	encourages	.68	4	-6	45	2	-2	-2	-7	-12	44	33
45	stimulates	.78	-5	1	104	-2	-2	-1	2	3	1	-0
23	inspires	.92	-9	4	116	-2	0	-4	-4	1	1	-3
3	arranges	.74	4	4	-2	92	2	-3	-3	3	-7	10
43	schedules	.85	-5	-0	-0	99	4	6	5	-8	-7	8
28	organizes	.84	2	-3	-2	99	-5	-6	11	3	9	-7
32	plans	.89	-2	3	-1	106	0	-5	-10	5	9	-6
26	judges	.69	1	7	-5	-5	96	-6	6	2	7	-2
17	evaluates	.70	-1	-6	3	-2	98	-17	10	16	5	-8
20	grades	.82	-4	1	-1	5	106	5	-7	-10	-1	4
47	tests	.84	0	-1	-0	0	106	17	-7	-14	-2	3
37	reminds	.34	-15	13	-15	-2	-10	48	7	18	14	37
36	reinforces	.46	-15	-4	9	0	-7	65	-2	30	51	-26
41	reviews	.51	2	1	-6	3	7	99	-25	15	16	-9
38	repeats	.60	-12	3	-6	2	-13	101	-12	39	2	1
14	drills	.61	8	-2	-1	-7	7	130	4	-35	-9	3
4	assigns	.41	15	-11	13	25	6	47	59	-29	-33	8
30	permits	.43	12	3	-12	-7	-1	-18	75	-11	40	19
49	tutors	.33	0	-20	11	-4	-4	48	76	9	-11	-10
1	advises	.41	-13	-31	3	-4	-6	-5	96	21	13	24
8	controls	.68	2	42	-10	-6	-1	-9	108	-17	-1	-1
35	regulates	.52	-11	20	-5	2	3	-8	116	-7	-13	4
45	supervises	.40	-5	-23	2	5	0	-5	134	7	9	-26
33	questions	.30	10	-5	10	-2	34	9	4	36	2	-2
12	discusses	.52	45	-5	15	-7	-1	-4	19	51	-5	-5
7	confirms	.35	-20	-5	-10	-1	1	10	19	53	32	21
34	reasons	.33	-3	-4	-8	2	4	-16	13	60	5	42
2	answers	.40	-9	2	-2	1	25	13	-6	73	-12	17
24	interprets	.46	-2	0	0	-1	20	-14	9	92	-11	9
19	explains	.63	24	2	1	-3	-5	-7	7	95	-16	4
44	simplifies	.59	1	6	4	6	-11	4	-6	110	-2	-15
5	clarifies	.70	-9	4	2	1	-8	-5	-5	132	1	-9
42	rewards	.57	16	8	-1	3	10	3	2	-13	84	-10
6	commends	.67	10	-2	4	5	-1	-5	5	-6	86	5
50	urges	.65	0	-5	20	-1	-1	-3	-5	-11	10	95
9	convinces	.59	-3	-4	-7	1	-1	1	-4	10	-9	115
31	persuades	.69	3	-2	-5	1	0	-1	-5	-10	-0	123
Column Sum of Squares			5.01	5.88	3.10	4.06	4.45	5.21	7.45	7.25	2.72	4.83

* The entries in columns labeled 1 - 10 were multiplied by 100.

TABLE 3*

The $\hat{\Omega}$ - Matrix

	1	2	3	4	5	6	7	8	9	10
1	65	1	27	14	9	24	14	40	8	13
2	1	89	1	2	7	10	29	1	17	19
3	27	1	74	9	5	10	14	21	44	35
4	14	2	9	84	12	12	18	12	-1	6
5	9	7	5	12	73	18	10	13	10	7
6	24	10	10	12	18	45	16	29	10	14
7	14	29	14	18	10	16	32	16	15	22
8	40	1	21	12	13	29	16	51	13	19
9	8	17	44	-1	10	10	15	13	80	39
10	13	19	35	6	7	14	22	19	39	53

* The entries in this table were multiplied by 100.

APPENDIX H

DIRECTIONS FOR VERB SORTING

APPENDIX H

DIRECTIONS FOR VERB SORTING

VIEWPOINTS OF FACILITATING LEARNING
OF ELEMENTARY SCHOOL STUDENTS

Instruction Booklet E with Accompanying Verb Cards
(V. E. S10/1)

Your job will be to describe your views of the ways in which elementary school teachers facilitate the classroom learning of their students.

You are to think about what kinds of teaching behaviors you think are similar and what kinds of behaviors are different with respect to facilitating learning. You will describe your views by sorting the accompanying Verb Cards according to the directions on the following pages.

These considerations DO NOT involve any evaluation or judgments of "goodness" or "badness."

Before proceeding to the next page complete the following information:

1. Identification Number _____ (Number shown on first manila card)

2. Name _____

-- Now turn the page please and read the directions. --

Viewpoints of Facilitating Learning of Elementary School Students
(V. E. S10/1)

Directions

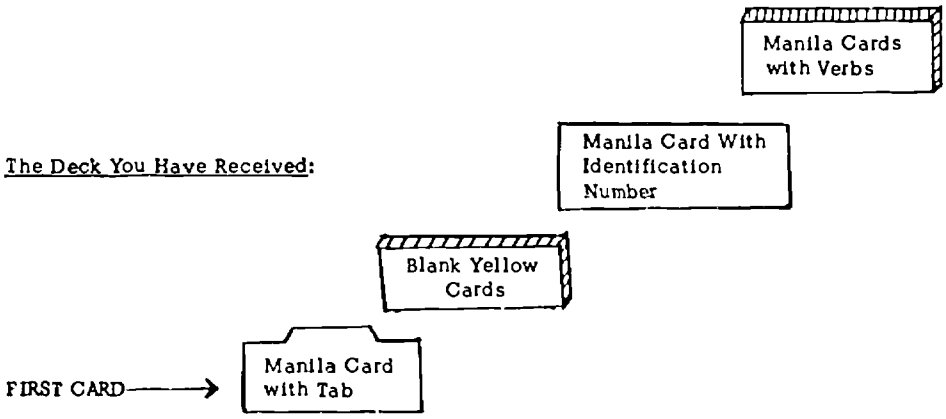
Elementary school teachers do many things in day-to-day teaching which may or may not facilitate the learning of their students.

What do you think are the kinds of things an elementary school teacher does with respect to facilitating learning of their students?

You will give your answer by sorting the Verb Cards into groups according to the directions below. The group of Verb Cards you have received are arranged as shown in Diagram 1.

Diagram 1

Arrangement of the Verb Cards Before Sorting



As you sort the Verb Cards you will group together those verbs which you think refer to the same kind or category of teaching behavior with respect to facilitating learning.

Each group that you form should contain verbs describing one kind of thing that elementary school teachers do with respect to facilitating learning of their students.

STOP!! Before you read the specific directions for sorting the Verb Cards the manual operations for handling the cards will be demonstrated.

(Demonstration by the researcher)

Any questions?

-- Now proceed to the next page and follow the directions step by step. --

Viewpoints of Facilitating Learning of Elementary School Students
(V. E. S10/1)

Directions ... continued

Carry out the following directions one step at a time:

First — Take a quick look through the Verb Cards. If any verbs are misspelled, ask the researcher for the correct verb.

Second — Starting from the top of the deck, pick up cards one by one and form groups indicating your ideas as to the kinds of things a teacher does with respect to facilitating learning of elementary school students. That is:

1. Beginning with the first card, consider the verb and think of the kind of teaching behavior it refers to with respect to facilitating learning of elementary school students. When you have decided, place the card down in front of you and write a note of your idea on the card.

2. Take the next card and consider the verb. Think of what kind of teaching it refers to with respect to facilitating learning of elementary school students. If it refers to the same kind of teaching as the first card, then put the two together. Otherwise begin a second group by placing the new card apart from the first card and make a note of your new idea.

3. Continue by picking up one card at a time and thinking of the kind of teaching behavior it refers to with respect to facilitating learning, and by either putting it in one of the groups already in front of you or beginning a new group.

Third — When you are finished with all the cards, go through your groups and review the ideas with special concern for whether the verbs belong together. You may make any changes, by dividing or combining groups or by switching verbs around.

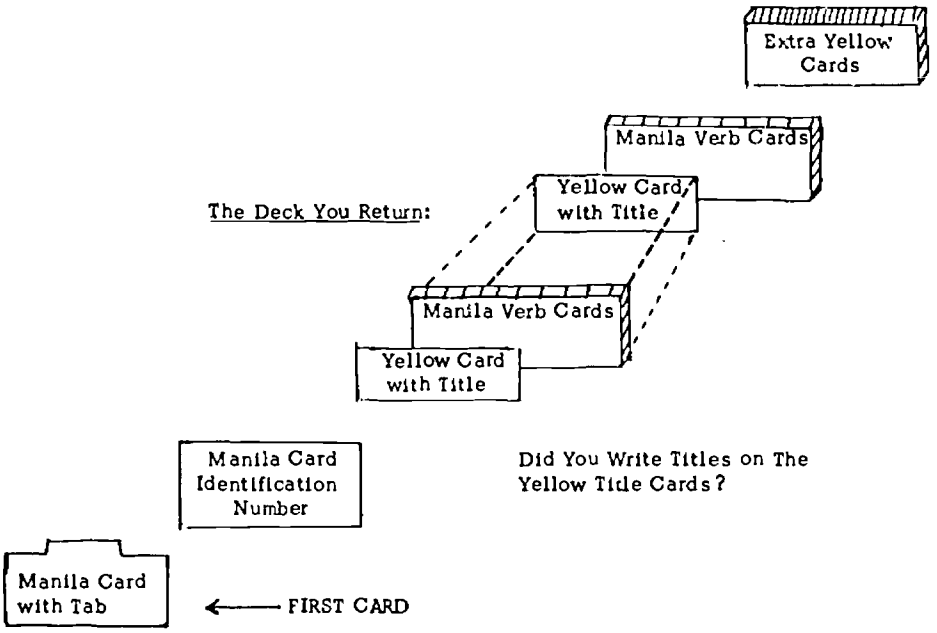
Fourth — When you have completely reviewed the groupings, put a Blank Yellow Card on top of each group.

Write, on each Blank Yellow Card, a word or a short phrase that you think best describes the central idea which caused you to place the cards together in that particular group. Remember that the idea should be concerned with facilitating the learning of elementary school students.

Fifth — Pick up each group of cards and put them together, keeping each pile separate by the placement of the Yellow Title Card Between each group. The arrangement of the groups of cards is given in Diagram 2.

Diagram 2

Arrangement of the Verb Cards After Sorting



Sixth Make sure you have filled in the information on the front page. Leave the booklet and the assembled cards in front of you.

Any questions?

(When you have finished please turn the booklet over and comment.)

APPENDIX I

Inventory of Classroom Learning Situations* (ICLS)

* This appendix is a shortened version of the inventory that was actually administered. Copies of the complete inventory are available at the Instructional Research Laboratory, 202 State Street, Madison, Wisconsin, 53706.

UNIVERSITY OF WISCONSIN

Research on Classroom Teaching

Inventory of Classroom Learning Situations

FORM 4F
May, 1965

This is a Confidential Document. All information you provide is confidential.

By answering the items of this Inventory on the basis of your own opinions and best judgments, you can make a contribution toward an understanding of classroom learning and teaching.

Complete all items in this Inventory. You will need to work thoughtfully, but rapidly.

Date_____

Name(Miss,Mrs.,Mr.)_____

School address (for forwarding report)

_____

_____

Teaching experience_____years

Now teaching grade(s)_____

---

* This Inventory is part of the Research on Classroom Teaching supported by the University of Wisconsin and the U. S. Office of Education, Project No. 2018. The investigators are Donald M. Miller, Philip Lambert, and John Guy Fowlkes.

(Do not turn the page.
Wait for directions.)

Inventory of Classroom Learning Situations

FORM 4F
May, 1965

Directions:

Pupils' classroom learning is influenced by a number of events and occurrences. This inventory of classroom learning situations has been assembled for the purpose of determining the effect of certain teaching practices. You, as a teacher and/or student of learning can best judge the degree to which the described actions influence pupils' learning.

1. Read each item thoughtfully, but rapidly. Here is an example of the items. (The names are fictitious.) READ then CIRCLE your answer.

   Item Example No. 1

   Miss Davis, by the second day of school, passes out most of the books that the pupils will be using. She likes to get this task accomplished as soon as possible.

   "Mike, will you please pass out these spelling books?"

   In this situation the practice of passing out most of the pupils' books by the second day of school...

0	1	2	3	4	5	6
Does Not Facilitate Learning		Slightly Facilitates Learning		Moderately Facilitates Learning		Greatly Facilitates Learning

2. Try to project or imagine the described situation occurring in a classroom in which you are the teacher. If you have had no experience with the grade level or the particular situation described, try to make a reasoned judgment in light of related experiences.

3. Make a judgment on the basis of what you think the consequences of the teacher's action would be in terms of facilitating the learning of the pupils.

4. Circle the number which best indicates your own judgment based on your classroom teaching experience.

5. Respond to every item. Check one choice only for each item.

6. Make your own judgments. Remember that there are no "right" answers.

PRACTICE ITEM

Item Example No. 2

Miss Roberts feels that shy students who are hesitant and afraid to address the class need moral support by working with other pupils. She therefore groups the class into panels when a social studies unit is being culminated.

"Ann, Mike, Sue, Don and Barbara, you will be members of the first panels."

In this situation the practice of having shy pupils report through panel groups...

0	1	2	3	4	5	6
Does Not Facilitate Learning		Slightly Facilitates Learning		Moderately Facilitates Learning		Greatly Facilitates Learning

STOP. Are there any questions?

Remember: Work thoughtfully, but rapidly.

Make sure you answer every item.

(Do not turn the page.
Wait for directions.)

01

To be sure that the pupils know their basic facts in arithmetic, Miss Davis often begins an arithmetic lesson with a drill. She feels drills stimulate pupils to learn their facts.

"I will flash the division fact cards. See how quickly you can answer."

In this situation the practice of frequently using drills for learning arithmetic facts...

0	1	2	3	4	5	6
Does Not Facilitate Learning		Slightly Facilitates Learning		Moderately Facilitates Learning		Greatly Facilitates Learning

02

Rules and regulations are briefly gone over the first thing in the morning, before recess, and before lunchtime by Miss Davis.

"Before we line up for recess, who can give me the rule for going after the soccer ball when it rolls into the street?"

In this situation the practice of reviewing rules and regulations first thing in the morning, before recess, and before lunchtime...

0	1	2	3	4	5	6
Does Not Facilitate Learning		Slightly Facilitates Learning		Moderately Facilitates Learning		Greatly Facilitates Learning

31

Mrs. Williams "plays it by ear" as to how often and how long she mentions rules to a group. The pupils' maturity and need of control determines her actions.

"We haven't talked about our behavior in the halls for a long time. Perhaps we should take a little time this morning to think about our hall rules."

In this situation the practice of "playing it by ear" as to how long and how often to mention rules...

0	1	2	3	4	5	6
Does Not Facilitate Learning		Slightly Facilitates Learning		Moderately Facilitates Learning		Greatly Facilitates Learning

32

In spelling instruction, Mrs. Williams closely follows the sequence and structure which is given in the text because the words are already analyzed.

"You may do the exercises in your spelling book now. Pay particular attention to the syllabication exercises."

In this situation the practice of closely following the spelling text...

0	1	2	3	4	5	6
Does Not Facilitate Learning		Slightly Facilitates Learning		Moderately Facilitates Learning		Greatly Facilitates Learning

Comments on the Inventory

1. Did you find it meaningful to rate the items on the Facilitation of Learning Scale?

0	1	2	3	4	5	6
Does Not Facilitate Learning		Slightly Facilitates Learning		Moderately Facilitates Learning		Greatly Facilitates Learning

2. Do you consider the items in this Inventory to be a realistic representation of actual classroom situations? (Explain)

3. What subject areas or teaching procedures do you feel have been omitted or neglected in the Inventory?

4. What is your general evaluation of the Inventory? (Feel free to go back over the items and make any specific comments you wish to. At the same time, please check again to see that you have answered every item.)

Thank you.

APPENDIX J

Inventory of Teaching Practices and Learning Situations* (ITPLS)

* This appendix is a shortened version of the inventory that was actually administered. Copies of the complete inventory are available at the Instructional Research Laboratory, 202 State Street, Madison, Wisconsin, 53706.

UNIVERSITY OF WISCONSIN

Research on Classroom Teaching

Inventory of Teaching Practices and Learning Situations

FORM B - PR No. 2
January, 1965

All the information you provide on this questionnaire will remain confidential. By answering these items on the basis of your own opinions and best judgments you can make a contribution toward an understanding of classroom learning and teaching.

Date_____

Name_____

Address (for forwarding report)

_____

_____

Teaching experience_____years

Now teaching grade(s)_____

(Do not turn the page.
Wait for Directions.)

Inventory of Teaching Practices and Learning Situations

FORM B - PR No. 2
January, 1965

Directions:

1. This Inventory of classroom learning situations has been assembled for the purpose of determining the effects of certain teaching practices on pupils' classroom learning. Included in this purpose is an investigation of the influence of different classroom situations on the teaching practices themselves. You, as a teacher and for student of learning, can best judge the degree to which the described action in each item facilitates pupils' classroom learning.

2. Here is an example of the items in the Inventory.

   Read the item and consider the situation described.

   Make a judgment of what you think would be the effect of the teacher's actions and practices on pupil learning.

   Circle the number which in your judgment best indicates the outcome in terms of facilitating pupil learning.

   E.g., If you think that pupil learning would only be "slightly facilitated," circle "2;" if "greatly facilitated," circle "6."

   S1(01)

   A first-grade teacher is conducting a spelling lesson. The words are from the class's reading story.

   The teacher's instructional procedure is to teach the spelling words to the whole class using the board for illustration.

   Her purpose is to have the class memorize the correct spelling of the words by copying them ten times.

   In this situation, to what degree will this teaching practice facilitate pupils' learning?

0	1	2	3	4	5	6
Does Not Facilitate		Slightly Facilitates		Moderately Facilitates		Greatly Facilitates

   After answering the above item, turn the page and continue reading the directions.

Directions continued...

3. Try to project or imagine the described situation occurring in a classroom in which you are the teacher. Pay particular attention to the information which is underlined in the sample item; it is this which primarily defines each specific situation and should influence the effect of the teaching practice on the facilitation of learning.

4. For simplification and consistency, the teachers described are female, and all grades are either first or sixth. If you have had no experience with these grade levels, try to make a reasoned judgment in light of related experiences and on the basis of how the teacher's action, in each particular situation, influences learning.

5. Circle one response only for each item and answer all items.

   Make your own judgments.

   Remember that there are no "right" answers.

(Please wait for further directions.)

PRACTICE ITEMS

(Pay particular attention to the underlined sections.)

S2(14)

A sixth-grade teacher is instructing her class on the geographic regions of China. A large wall map of the Far East is placed at the front of the room.

The teacher's instructional procedure is to closely supervise the work of the whole class while she gives the lesson.

Her purpose is to elicit pupil insight of the regions by having them discover relationships between them.

In this situation, to what degree will this teaching practice facilitate pupils' learning?

0	1	2	3	4	5	6
Does Not Facilitate		Slightly Facilitates		Moderately Facilitates		Greatly Facilitates

S3(08)

A first-grade teacher is conducting a lesson on nutrition. Individual booklets on the "basic-seven" foods are being used for reference.

The teacher's instructional procedure is to have the pupils learn together in small groups with minimal teacher direction.

Her purpose is to encourage learning about nutrition by having each pupil make up his own breakfast menu.

In this situation, to what degree will this teaching practice facilitate pupils' learning?

0	1	2	3	4	5	6
Does Not Facilitate		Slightly Facilitates		Moderately Facilitates		Greatly Facilitates

STOP. Are there any questions?

Remember: Work thoughtfully but rapidly.
Make sure you answer every item.

(Do not turn the page. Wait for directions)

01(10)

A sixth-grade teacher is conducting a lesson on the spelling of those plurals which are "exceptions to the rule." Word analysis in a reading assignment uncovered a need for this skill.

The teacher's procedure is to print a list of singular nouns on the board and ask various pupils how the plurals of these words would be spelled.

Her purpose is to have the pupils teach themselves by trying to figure out the correct spelling of these plurals.

In this situation, to what degree will this teaching practice facilitate pupils' learning?

0	1	2	3	4	5	6
Does Not Facilitate		Slightly Facilitates		Moderately Facilitates		Greatly Facilitates

02(03)

A first-grade teacher is conducting a grammar lesson on action words. Worksheets containing the present tense of these action words are handed out to the class.

The teacher's instructional procedure is to have the pupils fill in the past tenses of the action words in the sentences on the worksheets.

Her purpose is to have the class practice writing different action words to learn their correct usages.

In this situation, to what degree will this teaching practice facilitate pupils' learning?

0	1	2	3	4	5	6
Does Not Facilitate		Slightly Facilitates		Moderately Facilitates		Greatly Facilitates

27(13)

A sixth-grade teacher is instructing her class about the history of Alaska. Supplementary books are used in addition to the textbook.

The teacher's instructional procedure is to talk to the whole class about the assigned readings.

Her purpose is to have the class learn Alaskan history by memorizing a list of important incidents.

In this situation, to what degree will this teaching practice facilitate pupils' learning?

0	1	2	3	4	5	6
Does Not Facilitate		Slightly Facilitates		Moderately Facilitates		Greatly Facilitates

28(15)

A sixth-grade teacher is conducting a lesson on the geographic regions of South America. Posters of South American countries form a classroom display.

The teacher's instructional procedure is to have the class work individually collecting facts from library books.

Her purpose is to have the pupils learn and memorize these facts by copying statements from the books.

In this situation, to what degree will this teaching practice facilitate pupils' learning?

0	1	2	3	4	5	6
Does Not Facilitate		Slightly Facilitates		Moderately Facilitates		Greatly Facilitates

APPENDIX K

Instructional Cooperation Questionnaire

INFORMATION CONCERNING SCHOOL
AND STAFF ORGANIZATION

Name_____School_____Date_____

Grade_____Years of experience_____

No. of teachers in your school building_____Yrs. in present bldg._____

Question		Circle Your Answer	
1	Do you teach all subjects to all the children in your class? If "No" describe_____ _____	Yes	No
2	During the past two weeks has another teacher taken over any of your classes (of those you regularly teach) at your request? If "Yes" describe_____ _____	Yes	No
3	If you were absent tomorrow would your classes be taken over by a substitute teacher? If "No" who would take over (check) ___ a. traveling teacher ___ b. supervisor ___ c. other	No	Yes
4	During the past two weeks has another teacher outlined and described a lesson for which you will be responsible?	No	Yes
5	During the past two weeks have you discussed your specific daily plans with another teacher in the building?	Yes	No
6	During the past two weeks did another teacher assist you in developing an instructional unit which you will be teaching?	No	Yes

Question		Circle Your Answer	
7	During the past two weeks did you jointly plan a lesson with another teacher?	Yes	No
8	During the past two weeks did you jointly conduct a lesson with another teacher?	Yes	No
9	During the past two weeks did you conduct a lesson so that it was correlated with a lesson taught by another teacher?	No	Yes
	If "Yes" describe_____		
	_____		
10	During the past two weeks have you, while conducting classes, been observed by another teacher?	No	Yes
	If "Yes" did you discuss your lesson with the teacher who was observing?	Yes	No
11	Think over the last time you filled out report cards:		
	a. Were you responsible for giving all grades in all subjects to a specific number of pupils?	Yes	No
	b. When assigning grades to each of the pupils, did you consult with another teacher?	No	Yes

(Turn booklet over and comment on the Inventory.)

APPENDIX L

DERIVATION OF CONTENT UNITS

in the

DEMONSTRATION SORTING KIT

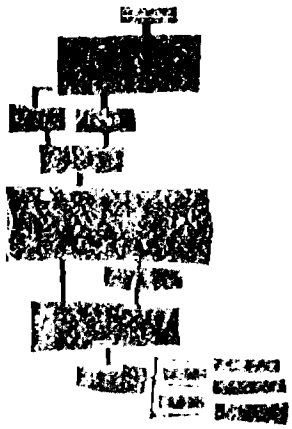
STRUCTURAL RELATIONSHIPS OF SEVENTEEN CONTENT UNITS

The Demonstration Sorting Kit contained in the pocket inside the back cover was provided to give the reader experience in the sorting procedures described in Chapter 6 and Chapter 11. Before the remainder of this appendix is read, the Demonstration Sorting Task should be performed.

If the reader has completed the Demonstration Sorting Task according to the directions given in the Sorting Kit, he will have constructed several categories by grouping or separating the seventeen content units provided. He will also have written his own description of each group of units in the form of a category title or label. Completing the task in this manner explicates something of the reader's perceptions and conceptions of facilitating learning. The reader may be curious about the ways in which other sorters have grouped the same seventeen content units. Because the seventeen units were selected from a set of 128 units sorted by 33 classroom teachers during Phase C of the project (see the Research Triptych in Chapter 2), comparison may be made to the latent partition of those teachers; complete detailed results appear in Chapter 12. To provide a quick comparison, the following list gives the interrelationships of the 17 units according to the latent partition of the 33 teachers. Chapter 12 should be studied for further details.

Latent Category[a]	Content Unit Code Numbers	
	Demonstration Kit	Sorting Experiment 3
1. Correlating Subjects	F	1
	J	2
4. Handling Discipline Problems	A	17
	N	18
5. Personal Relationships	B	21
	G	22
11. Drill	E	52
	I	53
	Q	13
12. Spelling	H	57
	M	58
	Q	13
17. Discovery Learning	L	75
	O	76
19. Fostering Pupil Initiative	C	81
	P	82
22. Parental Assistance	D	93
	K	94

[a] In the Confusion Matrix, the following pairs of categories had significant entries: 4 and 5; 11 and 12; 17 and 19.



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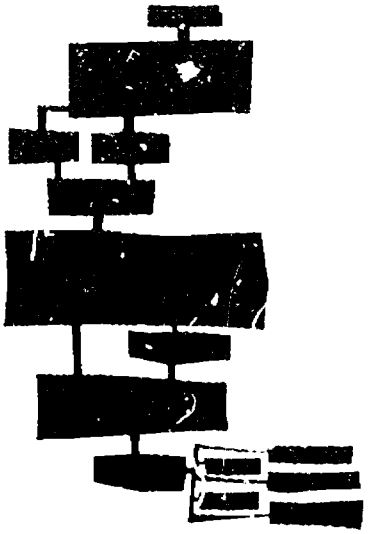

ELEMENTARY SCHOOL TEACHERS' VIEWPOINTS of CLASSROOM TEACHING and LEARNING

SORTING KIT

Demonstrating a Method

of

Observing and Recording the Viewpoints of Teachers

May, 1966

The University of Wisconsin — Instructional Research Laboratory

The Sorting Method to be demonstrated was developed and used for the purpose of observing the ways in which elementary school teachers think about facilitating the classroom learning of their students. This method will be demonstrated by giving you directions and a task similar to that which was used for collecting data for research purposes. By performing the demonstration task, you will gain some understanding of the characteristics of the sorting method, the thinking required to perform the tasks teachers completed, and the nature of the outcomes resulting from the sorting task.

DIRECTIONS

Consider the kinds of teaching behaviors exhibited by elementary school teachers as they attempt to facilitate the learning of their students in the classroom. Elementary school teachers do many things in day to day teaching which may or may not facilitate learning. What do you think are the kinds of things which elementary school teachers do with respect to the facilitation of learning? What kinds of behaviors do you think are similar and what kinds of behaviors do you think are different?

You will give your answer by sorting the statements* contained in the envelope on the opposite page. Here are two examples of the kinds of statements which you will sort into groups:

EXAMPLE A: This teacher feels that a picture on the child's cumulative record is helpful in getting acquainted with a child at the beginning of the year.

EXAMPLE B: This teacher feels that if helping one student is going to hold back the rest of the class, then it is wrong to work with that one student during class time.

You will sort the statements by grouping together those which you think refer to the same aspect or kind of teaching behavior with respect to facilitating learning. These considerations should not involve any evaluation or judgment of "goodness" or "badness". The criterion for your sorting is whether you think the statements are similar or different with respect to facilitating learning. Each group of statements should contain ideas which you think describe one kind of action, behavior or belief.

To form your groups carry out the following directions one step at a time:

First — Read and study the first statement in the envelope.

Second — Decide what aspect of facilitating learning the statement concerns.

Third — Write a tentative statement of this idea on the first holder.

Fourth — File the statement inside the holder.

Fifth — Repeat steps 1 - 4 for each statement. If any new statement concerns the same aspect of facilitating learning as one which you have previously sorted, put the two together. If not, begin a new group by writing a new tentative title on another holder and placing the statement inside.

Sixth — Resorting: At anytime during the sorting task you may come across a statement which does not belong where you have previously placed it. You may do one of three things with it...

a. Place it in another group.
b. Start a new group.
c. Mix it with the other statements not yet sorted.

Seventh — Review your groupings carefully. Review the ideas of each grouping with special concern for whether the statements belong together. You may make any changes by dividing, combining or switching the statements.

Finally — Check to see that you have written a word or short phrase on each holder used which you think best describes the central idea which caused you to place the statements together.

* See attached pages for list of statements

STATEMENTS OF BEHAVIOR

(In the original document each statement is on a separate slip, to enable sorting into categories.)

A. This teacher sometimes writes down students' names on a paper on her desk for misbehavior and then they both forget it.

B. This teacher says you have to laugh with your children, and at yourself, but never at the children.

C. This teacher tries to lead second graders, by the end of the year, to find out more information on their own from dictionaries and encyclopedias instead of depending entirely on her telling them.

D. This teacher never gives permission to take the worksheets home because she doesn't want parents doing the work, or helping too much.

E. This teacher feels that even if it is old-fashioned, she believes in giving a review of the multiplication tables every week because pupils like it and can see themselves improve.

F. This teacher combines spelling and language. This is at the seventh and eighth grade level.

G. This teacher thinks it is very important that you like your children because you have to trust your children and they have to trust you. It has to be a mutual feeling.

H. This primary teacher has students practice spelling words and writing on the board.

I. This teacher waits a couple of days, after concentrated work on a drill sheet, and then reviews the subject in which they had difficulty.

J. This teacher correlates social studies with art, such as drawing the Wilderness Road, what children thought it would look like.

K. This teacher gets parents to help as much as possible when students have difficulty with school work because it is easier for the teacher to work with the student when the parent backs him up.

L. This teacher never tells students the right answer. She answers a question with a question or guides them on how to find the answer.

M. This teacher would give children having difficulty in spelling more writing activities, such as using the spelling words in a story.

N. This teacher states that she takes those who just can't get along without disturbing others with her, if she must leave the room.

O. This fourth grade teacher doesn't tell her children the exact answer but shows them how to find it by rereading or looking at illustrations in order to come to logical conclusions.

P. This teacher states that students can be made aware of directions by having to read them for themselves; then, if they have questions she will help them.

Q. This teacher says the first grade previously handled objects before going into abstract ideas and number symbols of adding and subtracting.

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