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ABSTRACT

This panel's goal was to develop the means to improve teachers' ability to perform general and specific skills of teaching within curriculum areas and student development levels. The panel focused on research to improve teacher performance of instructional skills and identified two basic approaches to this research. The first approach dealt with the identification of important teaching skills by (1) utilizing statements drawn from psychological, developmental, and pedagogical theories, as well as theories of subject matter; (2) analyzing observed teacher practice into skill components and showing the relation of these components to educational outcomes; and (3) utilizing reports of teachers and other persons concerning what they believed to be important teaching skills. The second approach dealt with the identification of training and validation procedures which demonstrate how teaching skills are related to educational outcomes. This approach looked at (1) the transferability of skills, (2) the school conditions needed to optimize maintenance of important skills, (3) the development of measures to define the effectiveness of teaching skills, and (4) the relationship of skills possessed by individual teachers to educational outcomes. The panel identified specific programs of research and development related to each approach. Each program included descriptions of the criteria for judging the relevance of research projects within the program. (BD)

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NIE CONFERENCE ON STUDIES IN TEACHING

PANEL 4

TEACHING AS SKILL PERFORMANCE

GOAL STATEMENT

To develop the means to improve teachers' ability to perform general and specific skills of teaching within curriculum areas and student development levels.

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Washington, D. C.

May, 1975

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P R E F A C E

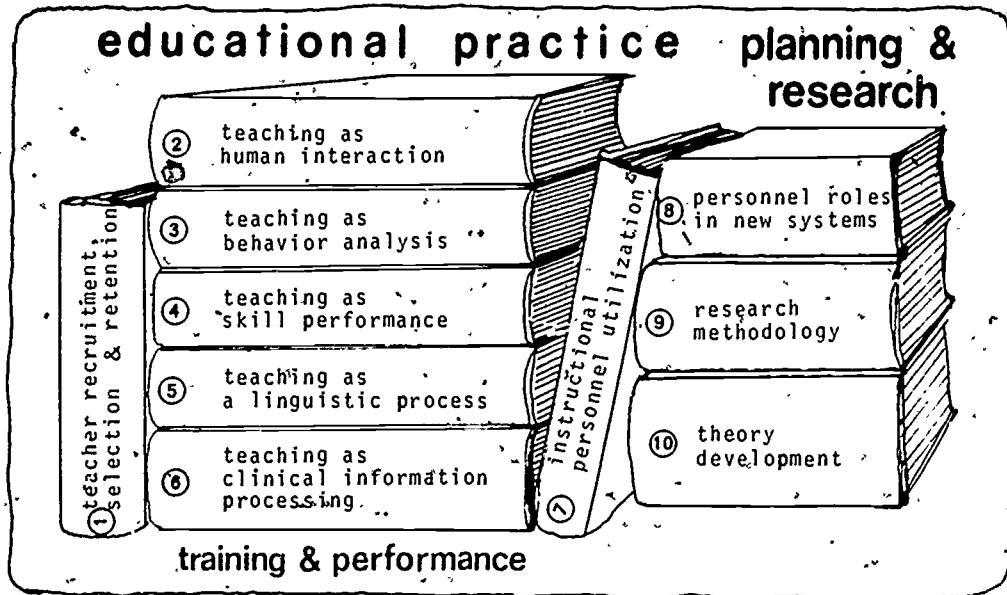
The volume before you is the report of one of ten panels that participated in a five-day conference in Washington during the summer of 1974. The primary objective of this Conference was to provide an agenda for further research and development to guide the Institute in its planning and funding over the next several years. Both by the involvement of some 100 respected practitioners, administrators, and researchers as panelists, and by the public debate and criticism of the panel reports, the Institute aims to create a major role for the practitioner and research communities in determining the direction of government funding.

The Conference itself is seen as only an event in the middle of the process. In many months of preparation for the Conference, the staff met with a number of groups--students, teachers, administrators, etc.--to develop coherent problem statements which served as a charge to the panelists. Panel chairmen and others met both before and after the Conference. Several other panelists were commissioned to pull together the major themes and recommendations that kept recurring in different panels (being reported in a separate Conference Summary Report). Reports are being distributed to practitioner and research communities. The Institute encourages other interest groups to debate and critique relevant panel reports from their own perspectives.

The Conference rationale stems from the frank acknowledgment that much of the funding for educational research and development projects has not been coordinated and sequenced in such a way as to avoid undue duplication yet fill significant gaps, or in such a way as to build a cumulative impact relevant to educational practice. Nor have an agency's affected constituencies ordinarily had the opportunity for public discussion of funding alternatives and proposed directions prior to the actual allocation of funds. The Conference is thus seen as the first major Federal effort to develop a coordinated research effort in the social sciences, the only comparable efforts being the National Cancer Plan and the National Heart and Lung Institute Plan, which served as models for the present Conference.

As one of the Conference panels points out, education in the United States is moving toward change, whether we do anything about it or not. The outcomes of sound research and development--though enlisting only a minute portion of the education dollar--provide the leverage by which such change can be afforded coherent direction.

In implementing these notions for the area of teaching, the Conference panels were organized around the major points in the career of a teacher: the teacher's recruitment and selection (one panel), training (five panels), and utilization (one panel). In addition, a panel was formed to examine the role of the teacher in new instructional systems. Finally, there were two panels dealing with research methodology and theory development.



Within its specific problem area, each panel refined its goal statement, outlined several "approaches" or overall strategies, identified potential "programs" within each approach, and sketched out illustrative projects so far as this was appropriate and feasible.

Since the brunt of this work was done in concentrated sessions in the space of a few days, the resulting documents are not polished, internally consistent, or exhaustive. They are working papers, and their publication is intended to stimulate debate and refinement. The full list of panel reports is given on the following page. We expect serious and concerned readers of the reports to have suggestions and comments. Such comments, or requests for other panel reports, should be directed to:

Assistant Director
 Program on Teaching and Curriculum
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As the organizer and overall chairman for the Conference and editor for this series of reports, Professor N. L. Gage of Stanford University richly deserves the appreciation of those in the field of teaching research and development. The panel chairpersons, singly and together, did remarkable jobs with the ambitious charge placed before them. Special acknowledgments are due to Philip Winne of Stanford University and to Arthur Young & Company for coordination and arrangements before, during, and after the Conference. But in sum toto, it is the expert panelists--each of whom made unique contributions in his or her respective area--who must be given credit for making the Conference productive up to the present stage. It is now up to the reader to carry through the refinement that the panelists have placed in your hands.

Garry L. McDaniel
Program on Teaching and Curriculum

LIST OF PANEL REPORTS AND CHAIRPERSONS

1. Teacher Recruitment, Selection, and Retention, Dr. James Deneen, Educational Testing Service
 2. Teaching as Human Interaction, Dr. Ned A. Flanders, Far West Laboratory for Educational Research and Development
 3. Teaching as Behavior Analysis, Dr. Don Bushell, Jr., University of Kansas
 4. Teaching as Skill Performance, Dr. Richard Turner, Indiana University.
 5. Teaching as a Linguistic Process in a Cultural Setting, Dr. Courtney Cazden, Harvard University
 6. Teaching as Clinical Information Processing, Dr. Lee S. Shulman, Michigan State University
 7. Instructional Personnel Utilization, Dean Robert Egbert, University of Nebraska
 8. Personnel Roles in New Instructional Systems, Dr. Susan Meyer Markle, University of Illinois
 9. Research Methodology, Dr. Andrew Porter, Michigan State University
 10. Theory Development, Dr. Richard Snow, Stanford University
- Conference on Studies in Teaching: Summary Report, Dr. N. L. Gage, Stanford University

INTRODUCTION

Background and Method Used to Produce the Recommendations

Panel 4 focused on research to improve teacher performance of skills. Two basic approaches to this research were identified. The first deals with the identification of important teaching skills, the second with training and validation procedures which demonstrate how the skills are related to educational outcomes.

Three ways of identifying teaching skills were developed. The first utilizes theoretical statements drawn from psychological, developmental, and pedagogical theories, as well as theories of subject matter instruction, as the basic sources. These statements are to be reduced to operational definitions of clusters of skills, and these skills are subsequently identified in teacher behavior. This approach to skill definition is "open" and permits the introduction of new sets of skills as new ways of viewing education emerge. The second method for skill identification depends on analyzing observed teacher practice into skill components and showing empirically the relation of these components to educational outcomes. This method is intended to reveal the significant skills in current teaching practice. The third method for identifying skills uses reports of teachers and other persons concerning what they believe to be important teaching skills. This method identifies skills that are believed to be important in the practical conduct of teaching. None of these three methods stands completely alone as the method for identifying skills; rather they are complementary and should be made to converge so as to produce a common core of highly salient skills.

Research on training for and validating teacher skills is aimed at the complex problems of finding the best procedures for training teachers in their professional skills and of identifying the exact circumstances under which exercise of a particular skill will have optimum impact. Subordinate problems within this kind of research include determination of the transferability of skills as the circumstances surrounding, teaching change, and identification of the conditions needed in schools to optimize maintenance of important teaching skills and hence to prevent teachers from slipping into "bad practice". Certain theoretical problems are also identified as intrinsic to this line of research. The first deals with the metrics by which the elasticity, or variability in the effectiveness of

teaching skills can be defined; the second, with the repertoire of skills possessed by individual teachers and the relationship of this repertoire, as a set, to educational outcomes.

The format used by the Panel for elaborating the two general Approaches described above was to identify specific programs of research related to each Approach. Included in the program descriptions are criteria for judging the relevance of research projects related to the program; subsequently, illustrative projects are briefly described to clarify what the Panel intended by its statements about the program. These projects are not proposed to be funded, but only to illustrate a class of projects to be developed in the field and submitted for review and possible funding.

Organization of the Report

The description of the Panel's work begins with a presentation and discussion of the Panel's goal for research on teaching as skill performance, followed by an overview of the considerations by which the Panel ultimately arrived at the research Approaches mentioned above. Next is presented the decision-making structure which the Panel found useful in framing its thinking about specific programs and projects.

The remainder of the report presents, within each of the two Approaches in turn, the recommended programs and illustrative projects pertaining to the Panel's goal area.

Panel Goal Statement

The Panel's goal was to develop the means to improve teachers' ability to perform general and specific skills of teaching within curriculum areas and student developmental levels.

First the Panel examined alternative approaches to the definition of general and specific teaching skills. Although several issues were presented and discussed, no formal definition was made by the Panel. The following aspects of teaching skills were accepted, however, as a working characterization of the term 'skill':

- o Teaching skills exist in a variety of teacher roles, e.g., in relationships with school principals, or parents, as well as with students.
- o Teaching skills have consequences. A logical chain connects a specific skill with its consequences. The consequences can be both targeted (or direct) and peripheral (or indirect).
- o Operationally, teaching skills are time-bound in the sense that the outcomes or consequences of a skill must be observable within a reasonable period, e.g., a school year.

- o Specific teaching skills may be distinguished from skillfulness. The latter includes: (a) determining what is to be done, (b) asking whether a particular skill achieves the desired effect, and (c) timing the use of a specific skill to achieve the effect.
- o Specific teaching skills can be rated for quality.
- o Normative criteria have been established for the performance of certain teaching methods which incorporate specific skills.
- o Teaching skills are moderated by the context or situation in which they are performed.
- o A skill has an intentional or purposive aspect; i.e., there is a reason for performing a particular skill.
- o Skills of special interest to the panel are those which are trainable, but a second group of untrainable or difficult-to-train skills (or "aptitudes") is recognized.

Derivation of Approaches and Programs

Exhibit I lists the Approaches and programs which were proposed to the Panel in the preliminary materials, along with several programs proposed in early sessions of the Panel. The following discussion of the interrelations of these three Approaches documents some of the Panel's initial consideration, leading eventually to the combining of Approaches 4.2 and 4.3 into a single approach.

Identifying Teaching Skills (Approach 4.1): This Approach is concerned with identifying teaching skills related to Learner outcomes. Studies in this area would usually employ observational and analytic techniques in which the elements (observation categories, units of analysis) are derived from theory. These elements are then used in inservice field settings to identify and further define promising teaching skills. Correlational research is typically used to establish relationships between the designated learner outcomes and the skills identified. This Approach answers the question: "What specific teaching behaviors, skills and strategies are related to designated learner outcomes?"

Skill Training (Approach 4.2): Those skills identified in Approach 4.1 form the point of departure for proposed Approach 4.2, which is concerned with developing the means to train teachers in these skills. Approach 4.2 would use a rigorous development sequence to build the necessary training components. This strategy generally involves the following steps:

1. Develop a prototype training component designed to train teachers to use the specific behaviors identified at an acceptable skill level.



EXHIBIT I Initially Proposed Approaches and Possible Programs

Approach 4.1: Examine alternative approaches to the definition and identification of general and special teaching skills.

- o Examine facet theory as a technique for identifying skills.
- o Examine learning theories (behavioral, cognitive, information processing) as bases for identifying skills.
- o Examine curriculum and developmental theories as bases for identifying skills.
- o Examine theories of education as a means of deriving skills.
- o Natural Variability Strand: Examine teachers' skills or strategies of skills as they relate to differences in achievement levels of students in order to determine the skills or strategies which affect those differences.
- o Examine needs assessment and other expert opinion as a means of identifying skills.
- o Determine how the subject matter competency of teachers relates to teaching skills within a subject matter.

Approach 4.2: Examine and develop means to improve the degree to which teachers perform general and specific skills.

- o Develop methods of measuring the degree to which teachers can and will perform skills.
- o Develop efficient means to train teachers in general and special skills.
- o Determine the personal and environmental factors that lead to improvement or deterioration of teacher skills and apply this knowledge to facilitate skill improvement and avoid skill deterioration.

Approach 4.3: Determine the effects of various general and special skills on student achievement of educational objectives (cognitive, social-emotional, psychomotor).

- o Develop and apply techniques for efficient validation of skills in terms of effects on outcomes in student behavior during the teaching-learning process.
- o Develop and apply techniques for efficient validation of skills in terms of effects on outcomes in student achievement, retention, and transfer.

2. - Field test the prototype, collecting formative evaluation data.
3. Revise the prototypes as indicated by the evaluation if teachers do not reach criterion on the trained skills.

This sequence would be repeated until a training component was developed that met the developer's criteria in terms of both quantity and quality of teacher performance. It is possible that correlational studies will yield some skills that, for all practical purposes, are not trainable. These skills would, of course, be revealed in the research and development activities carried out under this approach.

The training strategies developed under Approach 4.2 would also produce a high level of teacher variability in certain skills which, in turn, would make it possible to study these skills in proposed Approach 4.3, the Validation Approach. This is particularly important for newly discovered teaching skills that occur very rarely in the repertoire of practicing teachers.

Several limitations apply to proposed Approach 4.2 in this form. The Panel would not propose that training materials or strategies be carried through the entire R&D sequence that is applied to commercially distributed products such as have been developed at the regional laboratories. By imposing the following limitations, a great deal of time and money can be saved:

1. Materials, etc., would be developed to the point that they can be used in experimental research but not to the point where they are ready for widespread use in pre-service or in-service teacher education. This is an important limitation, since the final revisions and national field tests needed to ready materials or processes for national use are very costly.
2. No dissemination effort would be carried out. Dissemination is extremely costly. However, the main reason that no dissemination would be funded is that, at this point, no cause-and-effect relationship has been established between teaching skills as trained by the 4.2 materials and learner outcomes.

A further limitation to Approach 4.2 studies as proposed is that such studies should not be funded unless definite plans have been made to employ the 4.2 materials in an experimental validation study. A weakness in most previous funding is that funds were provided to develop teacher training materials and test their effectiveness in changing teacher behavior, but were not provided to determine whether teacher use of the trained skills caused desired changes in learner outcomes. Correlational studies such as proposed for Approach 4.1 cannot establish this cause-and-effect relationship.

2
Validating Skills by Determining the Effects on Learning Outcomes (Approach 4.3): Once materials and strategies that will develop a desired set of teacher skills were built in Approach 4.2, these could be used as independent variables in studies funded under Approach 4.3.

Studies funded under 4.3 would normally employ experimental designs with pre-post measurement of both teacher skills and learner outcomes. There are, however, other designs and strategies that might be used in Approach 4.3. The investigator should not be confined to classical experimental designs.

In funding studies under Approach 4.3 it would be suggested by the Panel that small-scale experimental studies which employ in-depth data collection with samples of 20-50 teachers, plus their students, will be more cost-effective than large-scale studies. Such studies can be completed more rapidly and are also low enough in cost to permit replication to check important results. Studies of this magnitude are also within the capabilities of small research teams. Thus, a broader sample of available researchers could be employed in the program. The main limitation of small-scale studies is that the investigator's analysis must deal with relatively few variables. In studies that seek to consider a wide variety of skills, larger samples will be needed.

The Combining of Approaches 4.2 and 4.3 into a Single Approach 4.2: The previous discussion has pointed out the proviso that teacher training studies (Approach 4.2) should not ordinarily be carried out without some plans for validating such training against learner outcomes (Approach 4.3). Furthermore, while it is easy enough to distinguish between teacher training and classroom teaching, some of the prime research questions in these two areas are closely related, and it sometimes becomes academic to try to distinguish whether a particular research question is aimed more at improving the effectiveness of teacher skill performance or at improving the effects of such performance on learner outcomes.

In view of these considerations, the Panel decided to incorporate the concerns of Approaches 4.2 and 4.3 into a single Approach, thus allowing a somewhat different framing of the programs within this Approach. The Approaches and programs as finally adopted are shown in Exhibit II; the reader may judge for himself the appropriateness of the resulting organization.

Other Possible Approaches: The Panel considered other possible Approaches. It was acknowledged that the question of subject-matter competency was an important area of concern, not only in terms of knowledge in a particular field but also in terms of the appropriateness of different teaching procedures and techniques as a function of the subject matter and the developmental level. Rather than isolating this question to a single Approach, however, the Panel felt that it was properly an important concern for each program in each Approach.

Another proposed Approach dealt with the teacher's skill repertoire, to include such facets as clusters of skills, sequences of skills, and strategies of teaching. This took final shape as Program 4.2.6 under Approach 4.2.

Finally, the Panel considered another Approach dealing with the final development and dissemination of training materials and strategies which had been proven effective in the Approach 4.2 validation. However, the Panel concluded that these steps are costly and might better be allocated to funding agencies other than NIE.

EXHIBIT II Adopted Approaches and Programs

Approach 4.1: Examine alternative approaches to the definition and identification of general and special teaching skills.

Program 4.1.1: Develop and apply a conceptual-analytic method for identifying hypotheses about effective skills.

Program 4.1.2: Examine teacher's skills and strategies as they relate to differences in achievement levels of students in order to determine the skills or strategies which affect those differences.

Program 4.1.3: Examine needs assessment and other expert opinion as a means of identifying skills.

Approach 4.2: Examine alternative approaches to the training and validation of general and specific teaching skills.

Program 4.2.1: Examine changes in the effectiveness of skills caused by differences in pupil characteristics, including the determination of the smallest effective stimulus for eliciting a pupil response and the appropriate metrics for measuring skills.

Program 4.2.2: Determine which training strategies effectively produce acquisition of a skill at each of its levels, using variation in training as the independent variable and level of skill acquisition as the dependent variable.

Program 4.2.3: Determine the conditions which affect skill maintenance, e.g., age, sex, and class of students and socio-political context.

Program 4.2.4: Consider the transferability of skills, i.e., determine the level at which a skill is performed in Context B when it has been trained in Context A.

Program 4.2.5: Examine the validity of teaching skills-as-trained, including (a) the contribution of a skill-as-trained to the matrix of student outcomes, (b) the methodological problems in identifying the outcomes attributable to specific skills, (c) the identification of the dimensions, principal components, or facets of teaching skills-as-trained relative to the matrix of student outcomes.

Program 4.2.6: Examine the repertoire of skills, including: (a) the scope of effective skills, (b) the organization of skills, (c) the effects of clusters or subsets of skills in relation to student outcomes, and (d) the relation of skills to traits or aptitudes.

THEORETICAL FRAMEWORK: A DECISION-MAKING ANALYSIS FOR AN R&D STRATEGY

This section presents a structure of decisions that can be made about specific projects involving teaching skills. The problem to which it is addressed is that of how a funding agency should select from among proposals made to it so that the R&D strategy will have a coherent structure. The structure proposed here is designed to achieve this goal specifically for the programs and projects of Panel 4. Its generalizability to other approaches of other panels has not been tested.

As a structure it has general criteria built into it, and the assumptions underlying these criteria are spelled out below.

Assumptions about Research Programs

We assume that research on teaching skills should have practical value. Teachers will be trained to use validated skills and will be trained by using the strategies found to be most effective. The research program, therefore, must be accepted by the communities of its potential users as well as by the research community. Both kinds of acceptance may be difficult to achieve simultaneously because the different communities have different criteria for accepting a research program. Teachers, for example, are concerned about both the characteristics of the teaching skills and pupil behaviors which are the outcomes of these skills. Researchers are concerned that the research produce scientific knowledge and that the program allow for new approaches and ideas. Such criteria are not necessarily incompatible, particularly if the program as a whole represents a balance between applications of these criteria in selecting projects for funding.

We assume that a project must always have potential for yielding scientific knowledge, and that one ought not to sacrifice such high potential simply to gain acceptability in other communities. But a research program which is meant to have practical applications must find a way of insuring that the projects "make sense" to the community of potential users.

Two probabilities need to be estimated for each project:

P_p = probability of its results being accepted and used.

P_s = the probability that the project will have scientific value.

The goal of decision making is to optimize these probabilities for a single project insofar as possible and for a set of accumulated projects within a research program.

Assumptions about Pupil Outcomes

We assume that the degree to which parents, representatives, teachers, and administrators influence the priorities in selecting pupil outcomes as dependent variables will be directly related to the acceptability of a project and the potential use of the results by such persons. Research aimed at determining the antecedents of outcomes which are valued by these groups will "make sense" to these groups.

We assume that researchers are relatively neutral about the public and social significance of their choice of outcomes. The researcher is interested in causal connections; he needs to find a network of these to build theories. If he also has strong convictions about the social significance of effects on pupils based upon beliefs about what kind of society or educational system is desirable, he is acting more as a citizen whose views have sources of validity external to his line of research activity.

The researcher is free to be neutral; the non-research public in fact is not. The decision-maker balances these two interests in order to maximize support for a research program.

Assumptions about Teaching Skills

Some writers hold that the researcher ought to have complete autonomy in selecting his or her antecedent variables. Knowledge of theory, experience, and intention play a large role in the choice of such antecedents, and the researcher is better equipped to make such choices.

But others, such as teachers, are close to the phenomena being studied and may provide insights and a sense of realism. They can play a useful role in conceptualizing the domain of antecedent variables and provide useful ideas about antecedents likely to be linked to outcomes.

Teachers also have a stake in how the yield of research on teaching is used, and they have priorities about problems. Teachers are sensitive to the relation of teaching performance to the context in which it occurs. For these reasons the factors of acceptability and use must be considered.

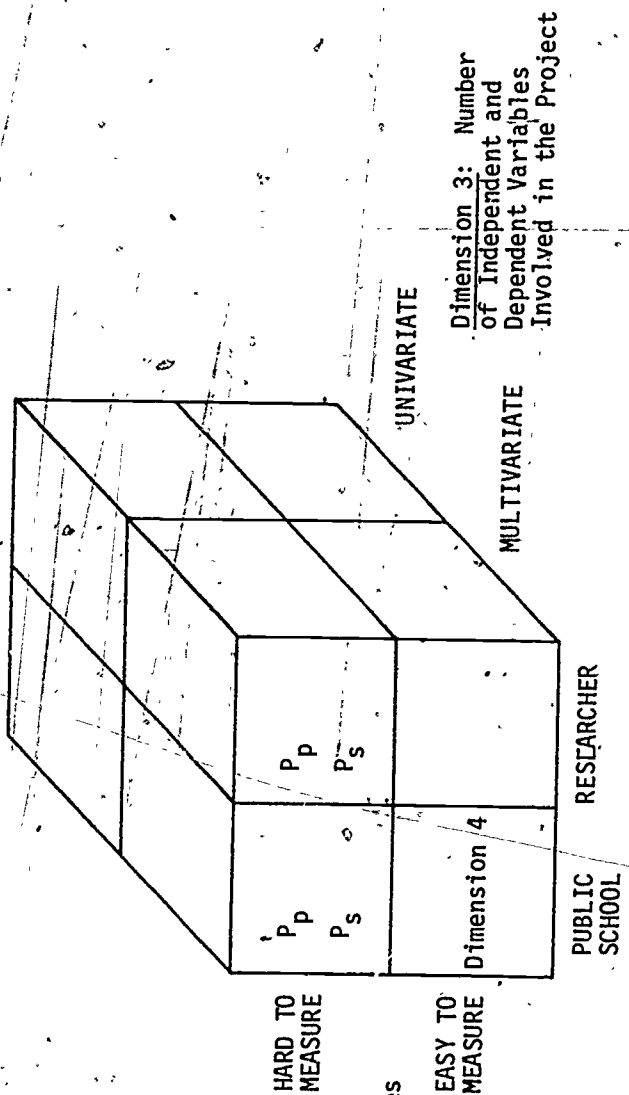
The Decision-Making Structure: A Matrix for Optimizing Selection of Projects

Exhibit III lays out the structure of information needed to make decisions that optimize support, use, and scientific payoff in a program of research. Not every project must completely optimize these factors. But the set of projects as a whole should. Thus, the decision maker is left with the problem of weighting choices at each step. No such set of weights is here proposed, but they should be developed and be made public.

The matrix shown in Exhibit III has four dimensions. Each of these dimensions represents a continuum which, for purposes of display, is shown as a dichotomy in the exhibit. Dimension 1 deals with the degree to which the antecedents to the research (independent and dependent variables) represent public school inputs and acceptability as opposed to researcher or scientific inputs. Dimension 2 represents the ease or difficulty of measuring the dependent and independent variables proposed in the project. This dimension is related to Dimension 1 in that the value assigned to particular variables by public school persons or researchers may be moderated by how easy or difficult these variables are to measure. Dimension 3 represents a central feature of the research design of the project--at one extreme (univariate) only one teacher training procedure or one teacher skill and/or one pupil outcome variable would be involved; at the other extreme multiple skills and multiple pupil outcomes would characterize the design. Again, this dimension is related to Dimensions 1 and 2. For example, a researcher may be attracted to univariate designs with easy-to-measure variables of his own choosing since he can optimize control of experimental error in such designs. Nonetheless, studies of this kind might be seen as having less practical value in the eyes of public school persons. Dimension 4 (represented within each of the cells of the matrix) directly addresses the question of research payoff. In this dimension, the decision maker must assign probabilities to both the potential acceptance and use of the project outcomes and to their potential for contributing to scientific knowledge.

It should be noted here that we assume the usual criteria for evaluating the specific proposal will be applied. A poorly designed experiment should be rejected; ill-conceived hypotheses ought not to be tested. If the usual criteria are applied, then hypothesis testing has greater immediate potential over work which is in one of the other phases. Thus, the vertical structure of the matrix informs the funding agency about the pattern of its proposals and raises questions about the proper balance among such projects.

An appropriate way to use the matrix is to analyze the proposal by identifying in which box at each step the proposal falls. At two significant phases the structure provides a schema of information about the involvement of different communities of concern and interest. It also provides a schema for checking the stage of development of the antecedent variables and their sources and of the development of the outcome measures.



Dimension 2: Difficulty of Measuring the Variables in the Project

HARD TO MEASURE

EASY TO MEASURE

Dimension 4

PUBLIC SCHOOL RESEARCHER

Dimension 1: Source of Inputs of Variables into the Research

Dimension 4: Probable Research Payoff:

P_p = Probability of acceptance and use (practical action)

P_s = Probability of scientific payoff (knowledge attainment)

EXHIBIT III A Structure for Making Decisions about Projects Related to Teaching Skills.

What This Structure Does Not Do. This structure does not provide the weights to be assigned to the elements of the structure, or the decision rules. If this concept of a structure is appealing, such problems can be addressed.

Not included also are the specific variables that might or should appear in the research program. Peer review processes will help make decisions about these choices. Although the structure does point to the relevant choice points in these matters, it does not set goals; it assumes them. It does not resolve methodological or theoretical issues. It simply points to choices to be made and raises the question of what criteria ought to be applied in making these choices. The Panel used the matrix to bring out choices, problems, and issues in conceptualizing. It was useful for this purpose. Others may find it similarly useful.

APPROACH 4.1

EXAMINE ALTERNATIVE APPROACHES TO THE DEFINITION AND IDENTIFICATION OF GENERAL AND SPECIAL TEACHING SKILLS

In the above discussion of the Derivation of Approaches and Programs, the Panel documented its assumption that research in the identification of teaching skills is a three-phase process including (a) the generation of hypotheses, (b) the development of training based on the hypothesized skills, and (c) the validation in terms of student outcomes. The latter two phases have been incorporated together in Approach 4.2. The Panel wants to emphasize that the programs and projects suggested under Approach 4.1 constitute only the first phase, and would still be subject to the training development and validation phases covered in Approach 4.2.

In focussing on the identification of teaching skills, the Panel identified three alternative methods, which are covered respectively in the three programs outlined under this Approach. The first of these is the conceptual-analytic method, which would use constructs drawn from educational theory, from patterns of school organization, or from curricular frameworks as a springboard for identifying teacher skills presumably correlated with learner outcomes. The second method is the observation and analysis of teacher practice in the attempt to relate skill components to student outcomes. The third method would utilize the judgments of teacher-practitioners and other knowledgeable observers as to the skills important in teaching. Hopefully, the results from these three methods would converge toward sound knowledge on the operation of teaching skills and their effects on desired outcomes.

Program 4.1.1: Employ a Conceptual-Analytic Method for Identifying Hypotheses about Effective Skills.

Learning occurs within a context that represents the intersection of theory, curriculum, and school organization. Whether explicitly

stated or not, one or more theoretical foundations underlie the content presented to the learner and the manner in which this presentation is made. Curricular frameworks further refine the content and methods of instruction. When viewed in concert with theory, this refinement may or may not be complementary. School organization likewise influences the mode and style of teaching and learning. The conceptual-analytic method of identifying skills can start with any of these three sources to generate conceptions of instructional roles, and of the teacher behaviors and skills associated with learner outcomes.

These three sources are not completely independent and may interact with or influence one another. Consequently, the sources may be employed separately or in combination to specify an instructional role and generate descriptions of skills. Exhibit IV shows the interrelationship of these three sources.

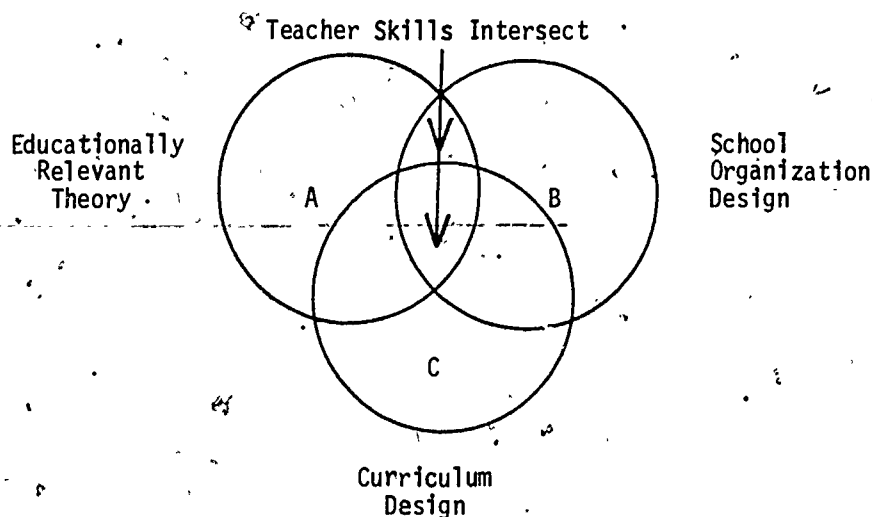


EXHIBIT IV The Intersection of Teacher Skills with Organization, Curriculum and Theory.

Educational Theory as a Source. The operationalization of a theory or set of theories constitutes the development of a model of teaching (See Models of Teaching by Joyce and Weil, 1972). A model of teaching is the specification of a learning environment in terms of the teaching skills necessary to initiate it, maintain it, and modify it for learners.

Theory can be used as the major source of an instructional model. In a few cases, it has even been applied to the creation of the instructional roles for an entire school plan. An example is the extrapolation from John Dewey's theories (1916) to the models for the early Dewey schools. More often, theory is used to provide the specification for

instructional roles provided by curriculum and school design. Ausubel's theory of verbal learning (1963) was used as the design for the Georgia Geography Project. Counseling theories are often employed to design the role of counselor in a school.

Many applications of theory to education have been truncated because the type of research envisioned in this program has not been carried out. The theories have not been fully operationalized into a model of teaching, a training system relative to the skills of the model has not been developed, and the skills, and hence, the model, have not been validated with respect to pupil outcomes.

Projects to generate teaching skills should include the following elements:

1. Description of the theory and its potential for generating an instructional model.
 - a. The hypothetical model-relevant outcomes should be broadly indicated. (When refined, these become the dependent variables in the study.)
 - b. The anticipated broad outlines of the instructional model should be presented, together with needed support systems, settings, etc.
 - c. The rationale for the anticipated linkage between the model (type of teaching) and the outcomes should be presented, including any available empirical evidence and the grounding of the theory in a conceptual framework.
 - d. The relevance of the model to curriculum and school organization should be described, or a defense should be made of its adequacy for generating an instructional role on its own terms.
2. Procedures for operationalizing the theory.
 - a. "Scenarios" of activity developed from the theory need to be developed. (For example, Taba, 1966, generated verbal descriptions of an "inductive" model in terms of phases of cognitive "tasks.")
 - b. The teacher behaviors necessary to activate the scenario need to be specified. (These represent the pattern of skills relevant to the model.)
 - c. Instruments need to be developed or modified to assess teacher behavior. (Some existing instruments are relevant to the skill demands of some theories but not others.)

3. Clinical feasibility studies.
 - a. Procedures should be developed for generating a setting in which the scenario can be tried out.
 - b. A small pilot study should be developed. Several teachers or the investigator should try to carry out the scenario. Several attempts may be necessary before the theory is operational. The amount of time necessary for pilot studies will vary considerably depending on the requirements of application of the theory and the adequacy of scenario.
4. Identification of skills.
 - a. Analysis of the pilot data should identify skills characteristic of the model.
 - b. Hypotheses about the relationship of specific skills to specific outcomes should be generated.
5. If the above steps are conducted successfully, the next step is the design of the training and validation phases, as set forth in Approach 4.2.

School Organization as a Source. Schools can be organized in a variety of ways and characterized by any of a large number of theories of education. The combination of an organization and an approach toward education can greatly affect the instructional demands placed on any given teacher. For example, the role of a science center teacher in an "inquiry-oriented" school is quite different from the role of a self-contained classroom teacher in a "traditionally-oriented" school.

The analysis of the task demands of instructional roles in schools can generate hypotheses about outcome-related teaching skills. Many attempts to change school organization patterns or to implement alternative educational stances have evidently been very difficult because teachers have lacked the repertoire necessary for their new roles.

As in the case of the other conceptual-analytic sources, studies proceeding from role-demands follow three phases: hypothesis-generation, training development, and validation.

Projects in this area should include the following elements:

1. Definition of role-relevant outcomes. The assigned role is defined in terms of outcome-related instructional functions.
2. The creation of prototype settings for the enactment of the role. These settings become the laboratories for the hypothesis-generation process.

3. A process for making a task analysis of the teaching processes relative to the role. This process can be inductive, in which case it is accomplished by studying (describing, categorizing, coding) the behavior that teachers engage in as they enact the role in the prototype settings. Otherwise conceptual analysis is used, and sources of theory and curricular-instructional steps are utilized.

Curriculum Framework as a Source. Teaching and learning do not occur in a void. Something must be taught, and something must be learned. Generally, this something is designated by the curricular framework of the school. These frameworks specify such dimensions as the subject matter content; the approaches to thinking and the cognitive reorganization and restructuring to be acquired by the learner; the means whereby the learner is to be exposed to both the content and the thinking processes, e.g., the learning experiences and materials to be used; and the criteria by which learning of both content and thinking processes will be judged.

Obviously, specification of such requirements defines much of the context in which teaching and learning will occur and, in turn, influences the types of teaching skills required to support the learning task.

For example, the social science curriculum created by Taba (1966) designates the use of a particular form of inquiry learning: Learners are to move through a planned sequence of thinking. Analysis of this sequence would help identify those teaching skills that are most likely to support achievement of the learning outcomes described in the curriculum. The teacher's use of these skills while working with the curriculum could thus be described in measurable terms and then studied by means of observation.

Another example of the way in which a curriculum framework influences the range of teaching skills required to produce effective learning is the "new math" introduced in the 1960's. This framework emphasized understanding of mathematical concepts rather than rote learning of computational skills. The teaching skills supporting this shift in learning emphasis differed considerably from the previous skill set. Under the computational emphasis, the teacher's use of a high proportion of fact questions was desirable; under the "new math," higher cognitive questioning became an equally, or more, important teaching skill.

Hypothesis-generating projects in the curricular framework area might be expected to move through the following steps:

1. Identify the curricular area and the framework within that area to be analyzed. Generally, in order to merit analysis, this would be a new framework that incorporates a number of new ways of approaching teaching and learning and includes new subject matter content.

2. Analyze the framework in order to outline (a) the learning outcomes to be achieved; (b) the learning processes to be used and learner skills that are related to or are incorporated within these processes; (c) the instructional context required for learning to occur; (d) the model of teaching that underlies (a), (b), and (c).
3. Develop a model of teaching that supports the curriculum. This model may include single teaching skills that are logically related to achievement of specified learner outcomes and teaching skill repertoires that are most likely to produce the desired changes in the learner.
4. Operationalize the model by identifying descriptions of teaching skills and learner outcomes. The descriptions generally would include procedures for observing and measuring the occurrence of both teacher and learner behaviors.
5. Conduct a small-scale pilot test of the model to establish whether teachers can implement the model and to determine whether use of the teaching skills as described produces the desired learner outcomes.
6. From an analysis of the pilot test, generate hypotheses concerning which teaching skills are related to which learner outcomes within the curricular framework being considered.

The importance of this form of teaching skill identification was demonstrated during the 1960's. In that period many new curricula such as PSSC and BSCS were introduced without due concern for the necessary accompanying teaching skill requirements. The new curricula failed to achieve the desired learner outcomes in those many instances when teachers did not employ the required skills.

Multiple Sources: The Intersection of Theory, Curriculum, and School Organization. Because of "real world" circumstances, some of the most critical searches for descriptors of effective teaching will center on the intersections of theory, curriculum, and school organization.

Such searches have begun to take place only recently in, for example, the General Catalog of Teaching Skills (Turner, 1973) and the Educational Testing Service's review of literature regarding teaching skills in reading and mathematics (1974). Few research efforts have, as yet, extended these skill identification activities into the experimental validation of the effects of the skills upon learner outcomes or the study of training needs in the skill areas.

When this "intersectional approach" to identifying teaching skills is taken, all the analytic steps and procedures outlined above for

each of the three variable bases (theory, curriculum, and school organization) must be applied. The analysis may begin with any of the three areas. It must first consider the unique contribution of each area to the definition of teaching skills and learner outcomes; then determine whether the points of intersection expand, restrict, or modify the teaching skills and learning outcomes identified within the separate areas. From this, a single model of teaching and a single cluster of learning outcomes will emerge.

For example, in the area of reading as decoding, the following paradigm might be drawn for identifying teaching skills and learning outcomes:

1. The area of psycholinguistic theory would be analyzed for relevant learning outcomes and teaching skills.
2. A curricular framework, e.g., the Distar Reading Program, might be selected and analyzed. This analysis would be used to refine and modify the teaching skills and learning outcomes extracted from the theoretical areas.
3. An organizational system would be considered; in particular, a system that complemented the theoretical and curricular areas that had been selected for analysis.
4. A set of learning outcomes and a model of teaching involving several teaching skills and skill sequences would be developed and tested.

Such an analysis procedure leads to a complex and multi-dimensional definition of teaching skills. It is intriguing to consider the total possible effects of a point of intersection in which all contributing areas represent a consistent and complementary definition of relevant teaching skills. In other words, the point of intersection represents a major part of the contribution from each area.

An illustration of such a circumstance might be a school organized to provide many informal opportunities for learner-directed inquiry (see, for example, Bruner, 1966) with guidance from a curricular framework that incorporates and builds upon Piagetian theory. Here, theory, curriculum, and school organization are highly complementary. Teaching skills resulting from joint analysis of these areas should have a high potential for effecting the logically related learner outcomes.

Criteria for Evaluating Projects. Projects focusing on identifying teaching skills in the intersection of theory, curriculum, and school organization should be evaluated on the basis of the following criteria:

1. A plan for determining the applicability of the teaching skills to relevant learning outcomes.

2. A description of the data sources to be used.
 - a. A project proposal should include a matrix, or other form of display, outlining the dimensions of each area to be considered. In other words, delimit the general theory areas as well as the specific theories within each curricular area, and the specific organizational frameworks.
 - b. A discussion of the amount of learner variability within each area, as well as within the total interactive region, that may be expected to be due to teaching as contrasted with other moderators, such as home environment.
3. A statement concerning the relevance of the analysis to the present and future role of the teacher.
4. A plan to define the conception of teaching in terms of operations.
 - a. This plan should provide a means for developing descriptors of the teaching skills and learning outcomes.
 - b. The plan should include procedures for identifying or developing and testing observational and other means of measuring relevant teaching skills.
5. A discussion of the bases from which hypotheses will be generated regarding the relationship between teaching skills and learning outcomes.
6. A plan for determining (a) the trainability of the specified teaching skills and (b) the need for training if the skills are to be studied experimentally.
7. A presentation of the linkage of the project with future training projects and experimental studies of teaching.

Illustrative Projects. In relation to the preceding discussion, the illustrative projects which follow are organized in accord with the sources discussed. The first two projects (4.1.1.1 and 4.1.1.2) illustrate types of projects in Class I: Theory Sources. The next project (4.1.1.3) illustrates projects in Class II: School Organization Sources. Then Project 4.1.1.4 illustrates projects in Class III: Curricular Framework Sources. Finally, Project 4.1.1.5 illustrates projects in Class IV: Identifying Teaching Skills Based Upon the Intersection of Two or more Variable Bases.

Project 4.1.1.1: Examine the Influence of Pupil Characteristics on the Effectiveness of Teaching Skills Derived from a Theory of Inductive Teaching. Aptitude-treatment-interaction (ATI) research suggests that educational treatments should be influenced by pupil characteristics. Teacher skills are likely to be differentially effective, and descriptions of effectiveness are likely to have to be expressed in terms of pupil characteristics. There has been much ATI research. Theoretical models have related educational procedures to pupil class (Hunt, 1960). Few investigations have explored the effectiveness of specific teaching skills, such as those required in inductive teaching, in terms of pupil characteristics.

Project 4.1.1.2: Generate Hypotheses about Effective Teaching Skills through Operationalization of John Dewey's Social Theory. Most attempts to apply democratic process theory to education have run into severe difficulty because essential and valid teaching skills have not been created. Hence, systematic teacher training has not been developed.

There is a vast literature relative to democratic-process teaching theories (Dewey, 1916; Thelen, 1960; Hullfish and Smith, 1961). A considerable literature utilizing social climate categories has resulted in a complex pattern of results which suggest great variation in teacher behavior but as yet, an insufficient ground for specific-hypothesis-generation.

The specific objective of this project is to generate hypotheses about skills necessary to teach children to carry on democratic processes (e.g., to negotiate group goals and procedures). To achieve this objective, the following plan would be carried out: (a) develop an operational scenario from theory sources; (b) implement the scenario in pilot settings; (c) revise the scenario; (d) develop instruments for recording skills present; (e) identify skill descriptions by applying instruments in pilot tryouts; (f) develop measures of pupil acquisition of democratic process skills; and (g) generate hypotheses about specific skills and specific pupil outcomes.

Project 4.1.1.3: Generate Hypotheses about Teaching Skills from the Study of Teacher Adaptation to the Instructor's Role in Systems Oriented Instruction in Reading (e.g., IPI, IGE). Systems approaches to early reading cannot be carried out without teacher acquisition of relevant skills. The ability of teachers to transfer skills from one role to another--as well as their ability to acquire new skills--is virtually unknown.

There has been some attention to the requirements of systems approaches and a few training systems have been developed. The field is virtually barren, however, of studies of teachers' ability to adapt to systems approaches (e.g., Individually Prescribed Instruction), and only a few validation studies exist.

The specific objective of this project is to identify the skills teachers develop as they adapt to the role of instructional system facilitator and to generate hypotheses about the relationship of these

skills to specific learning outcomes. The plan to achieve this project objective would include: (a) selection of a comprehensive instructional system in a basic primary school curriculum area; (b) development of a setting in which the teacher can enact the role of facilitator to that system; (c) study of the variability in teacher behavior and student outcomes; (d) study of the changes in teacher behavior over time and determination of whether these are associated with changes in pupil outcomes; (e) generation of hypotheses about teaching skills which relate to pupil outcomes; and (f) development of training procedures and validation as outlined in Approach 4.2.

Project 4.1.1.4: Develop the Concepts Related to Subject Matter Competence with Respect to Teaching. There is a need to reexamine subject matter competence so as to generate content learning strategies in the preparation of teachers. In many content areas, knowledge is substituted for procedures.

Many of the studies of competency-based teacher education have focused on pedagogical procedures to the exclusion of procedures undertaken by practitioners of the fields being taught. Projects that have examined subject matter (e.g., ISCPET, in Purves, 1973) have conceptualized subject matter in terms of knowledge.

The specific objective of this project is to devise a conceptualization of teaching practice in a content area so as to provide a basis for identifying teacher skills unique to that area. The plan for such a project should include the following steps: (a) assemble subject matter experts in a field together with teachers and researchers; (b) produce a working document outlining teaching practice as subject matter competence; (c) select exemplary teachers with subject matter competence for observation and analysis; (d) reduce raw observational and analytic data to statements concerning subject matter competence and related pedagogical skills; and (e) develop training and validation processes as outlined in Approach 4.2.

Project 4.1.1.5: Identify Teaching Skills that are Logically Related to Advancing Learner's Level of Moral Development. Basic research on teaching as it affects moral development cannot be operationally defined without a project of this type. Relevant knowledge cannot be applied to the study of teaching without the completion of projects in this class.

Three kinds of current knowledge in this area are particularly relevant: (a) theories of moral development, such as Kohlberg's (1966), and theories of cognitive development, particularly from the Piagetian viewpoint; (b) curricula emphasizing moral development, such as Shaftel's applications of role playing to this area (1967), and (c) school organization based upon a social action viewpoint.

For initial steps in skill identification, see the Indiana University General Catalogue of Teaching Skills (Turner, 1973), chapter 3, and the Far West Laboratory's Minicourse on Discussing Controversial Issues (1974).

The specific objective of this project is to identify and operationally define teaching skills which are logically necessary to the achievement of moral development outcomes as defined by: (a) theoretical foundations relevant to education, (b) curricular frameworks, (c) school organization, and (d) the intersection of two or more of these elements.

The specific action plan would include the following steps:
 (a) complete a review of literature related to theories of moral-cognitive development, moral development curricula, and social-action school plans; (b) extract from the reviews a tentative set of learning outcomes and a logically related model of teaching; (c) define the model of teaching operationally by providing descriptions of teaching skills; (d) define the learning outcomes in terms of operations; and (e) test the model to determine whether teacher skills when used produce specified learner outcomes and whether teachers can learn and apply the model.

Program 4.1.2: Observe and Analyze Current Teacher Practice, in Relation to Student Outcomes, as a Means of Identifying Skills.

In selecting Program 4.1.2 as one of three programs under Approach 4.1, the Panel addressed three concerns: (a) skill identification, (b) characteristics of the studies to be funded, and (c) criteria for evaluating descriptive, observer-based studies designed to identify teaching skills. A brief discussion of each of these concerns follows.

Skill identification. With learner outcomes as a point of departure, this program would identify specific teacher behaviors that relate significantly to the designated learner outcomes.

Characteristics of the Studies to be Funded. These could be small-scale correlational studies using samples of 20-50 inservice teachers and their students. These teachers would be observed carefully in their regular teaching roles to identify and specify teaching skills and behaviors which appear to be related to the designated pupil outcomes. Pupil performance that preceded and followed the specified teaching behaviors would also be studied. Correlational techniques would be used to relate specific teacher behaviors to pupil outcomes while partialling out other major variables (such as learner ability) that might be related significantly to learner outcomes.

Criteria for Evaluating Descriptive, Observer-Based Studies Designed to Identify Teaching Skills. These criteria do not deal with general methodological factors applicable to any research project; they can however, be applied wither to single studies or clusters of related studies. In the latter case, the cluster of studies should be evaluated using the criteria. These criteria also deal with continua rather than dichotomies. After the desirable end of the continuum is identified, evaluation would consider how close to this end a given study approaches.

Ten specific criteria were identified by the Panel as particularly relevant to this program. First, studies in which observations are conducted on a wide variety of teaching situations are preferable to those that are limited to one situation. For example, a study that observes teaching in a variety of developmental levels, socio-economic levels, curriculum areas, and ethnic and racial groups is preferable to one that does not. Any study seeking to define the skills of teachers from the observation of teacher performance must fully define the setting of

that performance. Setting includes the type of school, the type of classroom or learning environment, the characteristics of the learners, and the subject matter or skills being taught and learned. Generalizations from a single setting are suspect. But at the same time a researcher should justify the possibilities of generalization as well as the limits upon such generalization. The teachers themselves should vary in background, training, experience, and orientation so that skills can be related to such personal variables. Such variations in teaching environments and teacher characteristics increase the probability that skills will emerge and give the investigator a better insight into the general utility of the skills he discovers.

Second, studies that propose to explore areas of teaching where there is a good chance of locating skills that can be linked directly to learner outcomes are preferable to studies in which the linkage seems poor.

Third, studies that look at the differences in effectiveness of specific teaching skills in achieving different kinds of instructional goals (such as knowledge acquisition vs. ability to manipulate ideas) are preferable to those that focus on a single kind of learning.

Fourth, studies that explore why teachers use a given behavior are preferable to those which do not.

Fifth, studies that combine two starting-point strategies are preferable to those that are limited to one or the other. The two starting-point strategies are those that (a) start with pupil outcomes and try to define the teaching skills that lead to these outcomes, and (b) start with an observation of teaching behavior and try to hypothesize how tentatively identified skills might affect pupil outcomes.

Sixth, studies that look at antecedent and consequent learner behavior are preferable to those that look only at the teaching skills; i.e., observations of teaching skills are more likely to be productive when fitted into the context of learner behavior.

Seventh, studies supported by a firm rationale or justification based upon previous research, theory, and expert judgment are preferable to studies less well supported.

Eighth, studies that use several theoretical frames of reference to identify skills to be observed are preferable to studies that focus on a single frame of reference.

Ninth, studies that employ more than one data collection strategy (e.g., direct observation vs. videotape analysis vs. typescript analysis) are preferable since they are less likely to yield results that are artifacts of the data collection system. There are a variety of recognized schemes for the observation of teaching. Such schemes necessarily

determine what is observed and classified as a skill. A research project should allow the researcher to discover new skills or frames of reference as well as to employ existing frames.

And finally, studies that combine tightly controlled simulations with observations in naturalistic field settings and use one strategy to cross-check against the other are preferable to single-strategy approaches.

Illustrative Projects. The Panel outlined three projects which attempt to fulfill these criteria.

Project 4.1.2.1: Use Inductive Methods to Determine Teaching Skills from Observational Surveys of Teachers in High-and-Low-Achieving Schools. Teacher skills should be related to agreed-upon achievement data, but previous research has not clearly identified teacher skills associated with student outcomes in high- versus low-achieving schools. In most studies of achievement variation between schools about 50% of the variance remains unexplained. Evidence, from the Equal Educational Opportunity Survey (Coleman et al., 1966) especially, suggests that a portion of, this variance is attributable to differences in teacher skills between schools.

The specific objective of this project is to obtain information concerning teacher behaviors and skills in high and low achieving schools. The action plan for accomplishing this objective would entail: (a) using existing data from surveys of achievement in urban areas to identify similar schools that fall far above or far below the regression line; (b) observing teachers and their classes in these schools; and (c) defining, from the observation, a list of skills for subsequent validation.

Project 4.1.2.2: Determine Relationships Between Frame Factors and the Effectiveness of Teaching Skills. There is a need to look at the ways by which different institutional and societal factors "frame" the teacher's actions so that "good" teaching produces desirable student outcomes in one frame and not in another. Studies have shown variations in the effectiveness of teacher skills from class to class or from school to school (e.g., Brophy and Evertson, 1974). The concept of frame (Dahlöf, 1971; Lundgren, 1972; Kallós, 1973) might help to explain some of the reasons for this phenomenon.

The specific objective of this project is to delineate those frame factors that most exert influence on the effectiveness of teaching performance. The action plan would involve: (a) determining a subjective outcome area; (b) determining frame factors of sufficient variability; (c) sending teams of observers to note teachers' acts in relation to pupil outcomes and note specific frame factors; and (d) when successful acts in one frame are found, conduct an experiment to reproduce them in another frame to see if there are sustaining aspects of frame.

Project 4.1.2.3: Examine and Improve the Curriculum Modification Skills of Teachers. Curriculum plans and projects are either adapted to needs of particular students or, alternatively, closely followed. Instances of high achievement might point either to a teacher's modification of curriculum strategies or to a teacher's following guidelines exactly.

The specific objective of this project is to determine decision points, acts, and strategies by which teachers can adapt curricula to meet local needs. An action plan for achieving this objective would entail: (a) selecting a curriculum and sites where the curriculum has achieved success and sites where it has failed; (b) sending a team to observe the sites to determine the ways in which the curriculum was modified; (c) after analysis, sending observers into comparable sites to see whether teachers adopt similar modifications and strategies and hence, cross-validate; and (d) determining the modification acts and strategies that seem successful.

Program 4.1.3: Examine Needs Assessments and Other Kinds of Expert Opinion as a Means of Identifying Skills.

Practitioners, particularly teachers, and, for some purposes, students and parents, are in a good position to identify and clarify needs for new and improved teaching skills related to educational outcomes. Their advantageous position for doing this results from: (a) the frequent agreement among practitioners that presently employed skills are unsuccessful in producing desired outcomes, (b) requirements for new skills needed to bring about newly agreed-on outcomes, and (c) practitioners' hypotheses concerning particular skills that might contribute to better achievement of outcomes.

The assumptions in this program are that juries of practitioners can identify needs for research and development on teaching skills and that much research on improving skills will be enhanced and its useful results will be more fully implemented and disseminated if practitioners, researchers, and, for some purposes, students and parents, collaborate in the effort. In addition, practitioners will be more committed to the use of skills if they are involved in the research and development on the skills.

Criteria for Evaluating Practitioner-Based Studies Designed to Identify Teaching Skills. Specific criteria for projects in this program which should be met include:

1. The projects should be based upon assessment of the need for skills--assessment by practitioners, and, for some purposes, students and parents.
2. Projects should be field-centered and action-oriented.
3. The projects should be cooperatively conducted by practitioners and researchers.
4. Time allowances for such studies should take into account the possibility that their jury-based origins will result in societal consequences such that the jury will require immediate feedback.
5. Studies in which observations are conducted by a jury in a wide variety of teaching situations are preferable to those that are limited to one situation and a single observer.

6. Projects that propose to explore areas of teaching where there is a good chance of identifying skills that can be linked directly to learner outcomes should take priority over studies that explore areas in which the linkage between teaching skills and learner outcomes is complex and unclear.
7. Projects that relate teaching skills both to overall learner outcomes and to different outcomes for learners with different characteristics are preferable to studies that incorporate only one of these approaches.
8. Projects must clearly define the context in which they are to be conducted, including up-to-dateness of curriculum, availability of materials and media, manageability of teaching loads, time available to teach, and opportunity for maintenance of the skills.
- 9.. Studies must define the characteristics of teachers in order to relate skills to personal variables. And finally, studies should employ more than one data collecting device.

Illustrative Projects. Two illustrative projects (4.1.3.1 and 4.1.3.2) were presented by the Panel as examples of the types of projects included in Program 4.1.3. Because the projects are similar, they are combined for purposes of this report.

Project 4.1.3.1: Identify Teaching Skills Most Appropriate to Learning Outcomes in New Curricular Areas.

Project 4.1.3.2: Determine Significance of Student Learning Outcomes and Correlated Teaching Skills as Viewed by Juries of Teachers and Parents According to School Settings. Practitioners and clients (parents and students) should be involved in helping to identify the skills that teachers need for teaching students. There exists no reference document cataloging teaching skills and learner outcomes that the practitioners and parents consider important. Learner outcomes and teacher skills must be identified and defined by teachers and parents in terms of language and concepts which both groups can understand.

The specific objective of these projects would be to determine pupil outcomes and associated teaching skills identified as important in various settings (such as free school and inner city) by teachers and clients. To achieve this objective, the action plan would involve: (a) obtaining teaching outcomes and hypothesized associated skills from juries of practitioners and clients, (b) develop a classification system, and (c) develop a system for validating skills in various settings as per Approach 4.2. One potential barrier to completion of these projects is that parents may not be willing (or able) to address the needed teaching skills in detail. Teachers may also have difficulty specifying the skills they employ.

APPROACH 4.2

EXAMINE ALTERNATIVE APPROACHES TO THE TRAINING AND VALIDATION OF GENERAL AND SPECIFIC TEACHING SKILLS

As was discussed earlier in the introductory section on "Derivation of Approaches and Programs (Cf. pp. 5-6), this second Approach moves from identifying teaching skills to the use and testing of those skills in teacher training. Six programs were selected by the Panel as relevant areas for research and development under Approach 4.2.

Program 4.2.1: Examine Changes in the Effectiveness of Skills Caused By Differences in Pupil Characteristics.

No standard definition exists of the behavioral units constituting a "skill." Also, there are no fully appropriate metrics for measuring skills. One way to view this state of affairs is to assume that a skill is an elastic unit of behavior, the extent or magnitude of which depends on what constitutes an effective stimulus for the recipient, e.g., a student. For example, "probing" as a standard skill is suspected of being ineffective with young disadvantaged students; "higher order questions" are also suspected of being ineffective for such students when achievement tests are the criterion variable. One interpretation of the ineffectiveness of such "skills" is that, as practiced by teachers, they are not apprehended by certain students as effective stimuli even though they may be thus seen by adults. This interpretation implies that variation in the outcomes associated with particular teacher behaviors is predictable, is to be regarded as a function of the students taught, and is to be specifically regarded as a function of the smallest effective behavioral stimulus to which these students can or will respond. Similarly, the behavior constituting an effective skill may be highly elastic or of varying magnitudes depending on how many and what kinds of stimuli are needed to produce a given effect with particular students. The elasticity of a skill refers to its range of possible effective magnitudes, e.g., the possibility that a teacher

may withhold performance of a particular skill (reduce its magnitude to zero in cases where the performance of the skill would, in all likelihood, result in noneffectiveness, as for example, in "probing" the response of certain types of students. Project 4.2.1.1 illustrates the type of projects that would be conducted in Program 4.2.1.

Project 4.2.1.1: Study the Association Between Variations in Skill Magnitudes and Learner Outcomes in Reading at Three Grade Levels. The primary target group for this class of projects would be pupils varying in: (a) age or grade, (b) socio-economic status, and (c) where pertinent, race. At the present time no literature exists on skill magnitude relative to effectiveness of stimuli. Literature on effective stimuli must, however, be reviewed.

The specific objective of this project is to determine whether variation in skill magnitudes are correlates of on-task behavior and residual gain in reading. To achieve this objective, the following implementation plan is suggested:

1. Development of an observation system covering no less than five skills varying in magnitude.
2. Selection of sample schools.
3. Observation of designated classes to determine those that are high and low in on-task behavior.
4. Selection of contrast (high on-task, low on-task) classes.
5. Administration of pre-test reading performance.
6. Carrying out of in-class observation of skill magnitudes and reliability check on observations.
7. Administration of post-test of reading performance, and
8. Application of data analysis methodology.

Program 4.2.2: Determine Which Training Strategies Effectively Produce Acquisition of a Skill At Each Level of Skill Acquisition.

A major concern in all teacher training institutions as well as most school systems is to have access to the most effective strategies for producing specific teaching skills at each level of skill acquisition. At least four levels of acquisition must be considered--the cognitive level, the unit acquisition level, the unit fixation level, and the autonomous level (Fitts, 1962).

The cognitive level is defined as the conceptualization of the skills or incorporating into cognition the main features of the skill and its component parts.

The unit acquisition level is defined as the acquisition of the elements of the skill as a result of practice on the component parts of the skill.

The unit fixation level is defined as the integration of the parts into a correctly ordered, but not independent, operation of the skill.

The autonomous level is defined as a completely independent operation or mastery of the skill, i.e., the ability to perform it smoothly and efficiently when required.

Finding the best techniques for training at each of the levels of skill acquisition is the purpose of this program. Project 4.2.2.1 illustrates the type of projects included in Program 4.2.2.

Project 4.2.2.1: Determine the Effectiveness of Different Training Procedures for Developing Different Mastery Levels in the Training of Various Types of Skills. Some current knowledge in this area exists, such as that from: (a) work on instructional media, dating from Lumsdaine's early work (1963) to the present, much of it done in military settings; (b) Bandura and Walters' work on modeling (1963); (c) Stanford work on teacher training and microteaching; (d) current work on minicourses (such as that by Borg et al., 1970); and, (e) evaluation data from the Protocol Projects conducted by the Leadership Training Institute (1974) under the Educational Personnel Development Act (see also Borg and Stone, in press).

Further research in this area would produce results useful in designing more efficient and powerful training materials and strategies. The specific objective of this project is to determine which training procedures are most effective in bringing trainees up to different levels of acquisition of different types of teaching skills. To achieve this objective the project plan should initiate the following steps: (a) identify alternative training procedures, (b) operationalize skill acquisition levels, (c) identify types of skills, (d) set up a factorial design--probably a minimum of three factors would be needed, (e) design training strategies, (f) select subjects so that there is a minimum of about 300, (g) train subjects, and (h) assess effectiveness of training procedures for each level of skill acquisition.

Program 4.2.3: Determine the Conditions (e.g., Student Characteristics and Socio-Political Contexts) Which Maintain Teaching Skills.

Little is to be gained from training preservice or inservice teachers on specific teaching skills if these skills atrophy, or become distorted during extended classroom experience. Thus, investigation of the conditions that foster skill maintenance and improvement in actual teaching practice is needed to achieve the goal toward which Panel 4 is

directed. Projects 4.2.3.1 and 4.2.3.2 illustrate the types of projects that would be conducted in Program 4.2.3.

Project 4.2.3.1: Examine the Influence of Contextual Factors on the Maintenance of Skills in the Teaching of Reading and Mathematics. The primary target group of this project would be urban teachers whose classrooms are stratified by the socio-economic background of the students. The need for such a project exists because the level of performance of teachers varies with the appropriateness and level of support provided by the school. What factors in the social organization of the school, e.g., the amount and quality of administrative supervision, effective working relations among teachers, etc., influence the development and maintenance of specific teaching skills? Can inservice training geared to skill maintenance reduce or prevent decline in skill performance?

The sequence of events needed to achieve the project objective should include the following: (a) develop reliable instruments for skill assessment, and (b) select a sample of schools whose students have high and low residual mean scores for achievement in reading. This analysis will produce a sample of schools highly likely to differ in the following contextual variables: (i) socioeconomic status of the students; (ii) availability and variety of materials and teacher responsibility for the choice and use of the materials; (iii) staff support and morale, defined in part as degree of informal teacher communication and sharing; and (iv) quality of administration in terms of support, stimulation, direction, and feedback. Select control teachers randomly from the high and low residual groups of schools initially sampled which vary on the independent contextual variables being studied. Assess the skill level of the teachers in these schools bi-monthly for a period of two years. Select experimental teachers randomly, again insuring variance on the contextual variables, and use teachers' centers to maintain the minimum initial skill level. The experimental-group teachers are observed bi-monthly and receive skill training at appropriate intervals.

Key decision points during the course of the project would include: (a) selection of schools on the basis of residual achievement (b) establishment of teachers' centers and the training of teachers to initial skill level, (c) observations of teachers in the two sets of schools, and (d) maintenance of skills by means of the teachers' center.

This project could have important implications for the quality and focus of inservice teacher training if the independent variables are determined to be crucial to skill maintenance, thus suggesting directions for change in these school factors. If the teachers' center proves to be an adequate skill maintenance device, this option in teacher training would supplement the changes involving the school factors. If the teachers' center proves to be an inadequate skill maintenance device, this option in teacher training would supplement the changes involving the school factors.

Project 4.2.3.2: Review and Synthesize the Literature on Student Influence on Teacher Behaviors and Skills. This project should yield a system for classifying independent variables (the types of student behaviors influencing teachers) and the attendant dependent variables (teacher behaviors influenced). In addition, the project should yield suggestions as to the independent variables that have the greatest impact.

The specific objective of this project would be to synthesize the literature and produce a quasi-taxonomy of student-influence (independent) variables. To carry out the project, the sequence of events would include the following steps: (a) identify the literature sources, (b) review the sources, (c) organize the independent variables into a quasi-taxonomy, and (d) relate the dependent (teacher) variables to the independent variables by citing observed relationships and suggesting other probable relationships.

Program 4.2.4: Determine the Transferability of Teaching Skills.

The purpose of this program is to examine what happens to teacher activities in relation to pupil outcomes when the context changes. A simple example is the question of what happens to the activities of a teacher who, having learned to teach children reading in a "traditional" setting, is placed in an "open" classroom? What skills are transferable into the new situation in order to effect learning?

The variables involved in studies under this heading include student outcomes, teacher activities, and contexts. Studies would most likely consist of natural experiments as well as laboratory experiments, and might employ case study, as well as quasi-objective, techniques.

The range of contextual variables that research projects might explore is shown in Exhibit V. A brief definition of each of the types of contextual variables follows:

Student. A teacher might find himself or herself confronted by different mixtures of students classified by age, sex, ethno-cultural group, socio-economic status, intellectual-developmental level, or attitudes toward school, life, themselves, and others.

Institution. Teachers might move to different schools or live through changes in school size, organization (e.g., graded or nongraded), atmosphere or ambience, types of colleagues, physical format (e.g., fixed seat or "open"), presence or strength of teachers' organizations, administrative organization and decision making, or policy bases (e.g., change in school board).

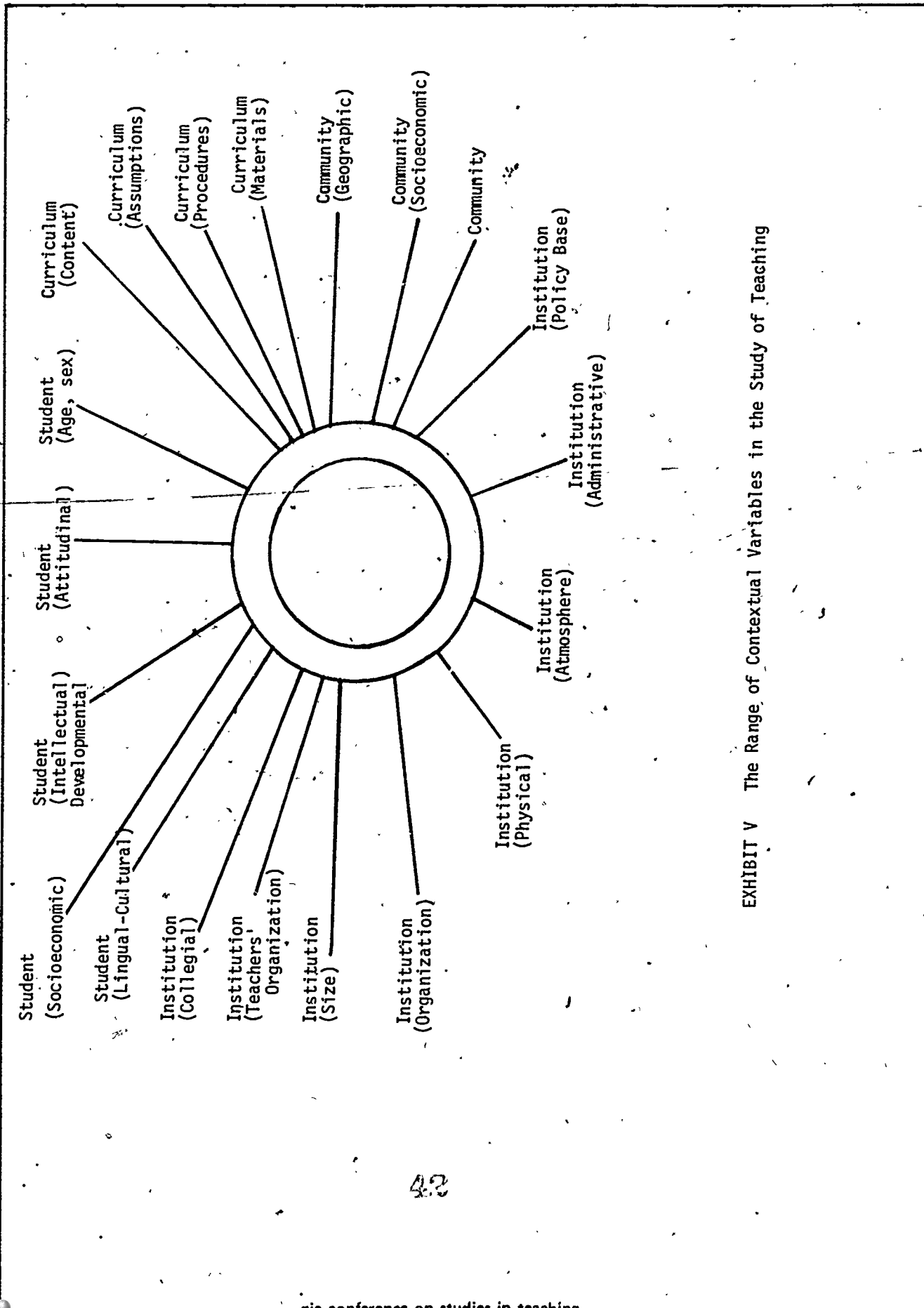


EXHIBIT V The Range of Contextual Variables in the Study of Teaching

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Community. Teachers might move to different geographical areas (e.g., different as to whether they are urban, suburban, or rural settings within a region), to schools whose clients come from socio-economic groups other than those to which the teachers are accustomed, or to schools in communities that use different languages or dialects.

Curriculum. A teacher might be confronted with changes in curriculum content or teaching procedure (e.g., from controlled-inductive to free-inductive modes of teaching social science), or in materials (e.g., from natural science taught with books and charts to natural science taught with live flora and fauna).

Projects 4.2.4.1 and 4.2.4.2 illustrate the type of projects to be considered in Program 4.2.4.

Project 4.2.4.1: Examine the Changes Teachers Make When Operating Under Different Curricular Assumptions. Information is needed on the changes teachers must make to adapt effectively to new assumptions about the curriculum. At present there is some information in studies of curriculum reform and change, but much of this information is embedded in evaluations of curriculum. (See also Chin and Downey in the Second Handbook on Research in Teaching, 1973.)

The specific objective of this project would be to determine what adaptations of successful teaching have to be made when assumptions about the curriculum are changed. To achieve this objective the following action plan is suggested. First, identify sites where teachers have successfully taught a subject (e.g., writing) under one set of assumptions but have decided that another set of assumptions is preferable. Second, observe teacher behavior under both sets of assumptions. Third, assess results of instruction. Fourth, do a correlational study to determine the relationship between teacher behavior and student achievement under the two sets of assumptions. And finally, experiment with behavioral changes in the light of the results of the correlational study.

Project 4.2.4.2: Develop the Means to Improve Transfer of Hypothesized Generic Skills Within an Instructional Approach (Model) Across Subject Matter Areas. The primary target population for this project consists of elementary school teachers teaching more than one subject. It may also apply to secondary teachers where more than one subject is taught. Projects in this class are intended to determine: (a) whether or not models of instruction transfer across subjects and (b) whether skills within teaching functions specifically transfer.

Current knowledge existing in this area includes B. Joyce and M. Weil, Models of Teaching, 1972; J. Henderson, How Should You Teach to be Effective?, 1973; and R. Turner (Ed.), General Catalog of Teaching Skills, 1973.

Experience indicates that different models of teaching can be operationalized within subject areas. The transferability of the models and the skills entailed in them across subject areas is the issue addressed.

The specific objective for this project is to test the transferability of the teacher's pupil-assessment skills, goal-setting skills, instructional-strategy skills, and achievement-evaluation skills across subject areas.

To carry out this objective, it is anticipated that the sequence of steps would include the following:

1. Train preservice teachers in an experimental group on four sets of four skills each to at least the unit fixation level of skill acquisition in teaching reading; one control group would not be trained by the instructional system and a second control group would be trained in mathematics but not reading.
2. Develop the resources for an instructional unit in reading at each of three primary grade levels.
3. Obtain primary school classrooms for replicating the unit instruction 15 times within grade levels (may be done during student teaching).
4. Randomly assign the trainees to classes within grade levels.
5. Give reading pretests to the students of all three groups of teachers.
6. Have one-third of the trainees conduct the instructional unit in reading.
7. Post-test the students of teachers in all three groups.
8. Holding classroom constant, assign the trainees a unit of instruction in mathematics for which resources are provided.
9. Pretest the students in the unit of mathematics instruction.
10. Have the trainees teach the mathematics unit.
11. Post-test the students in the unit of mathematics instruction.
12. Use analysis of co-variance in the following transfer design, stratified by grade.

Group of Teachers By Training Received	Unit of Instruction Carried Out	
	Reading	Mathematics
Reading Training Experimental Group	X	X
Mathematics Training Control Group	-	X
No Training Control Group	X	X

Program 4.2.5: Examine the Validity of Teaching Skills-As-Trained.

While this program was not developed in any detail by the Panel, major methodological problems were recognized in validating skills-as-trained, in finding alternative training procedures to circumvent these problems, and in attempting to increase the effects of (variance attributed to) teacher skills. Project 4.2.5.1 illustrates the types of projects included in Program 4.2.5.

Project 4.2.5.1: Examine Continuous Feedback from Students on a Single Teacher Behavior Variable as a Means of Changing Instructor Behavior and Student Outcomes. This illustrative project is essentially an alternative to the more conventional training studies carried out in Approach 4.2. This type of project, may, however, open up a new skills-shaping strategy that could be much less costly than developing and field testing elaborate training materials. In terms of current knowledge in this area, some of Bandura and Walters' work (1963) might be relevant. Semmel at Indiana is doing related work on feedback of teacher-student interaction data (personal communication, 1974). Most feedback research would be related. Pilot work on the feedback display board has been done at Utah State University (Borg and Stone, in press).

The specific objective of this illustrative project is to determine whether immediate feedback from students on some aspect of the teacher's performance, will lead to changes in teacher behavior and related learner outcomes.

In terms of availability of skill and facility resources, only the pilot studies at Utah State University are closely related as far as is known.

The action plan for conducting such a project should include the following sequence of events: (a) develop the feedback display board (a prototype is now in use), (b) select specific areas of teacher behavior in which feedback will be given, (c) during specified lessons, collect baseline data on teaching performance and learner outcomes, (d) introduce continuous feedback display and observe instructor behavior, (e) measure relevant learner outcomes, (f) repeat second through fifth steps for different kinds of feedback, and (g) analyze results.

Program 4.2.6: Examine the Teacher's Repertoire of Skills, Including Its Scope, Organization, Effects on Student Outcomes, and Relations to Teacher Characteristics.

Effective teaching may be defined along numerous dimensions ranging from the total Gestalt evidenced by a teacher to a quantitative measure of a specific behavior, such as how many times in a 15-minute period the teacher provides positive reinforcement to learners. Between these two points on a continuum are innumerable ways to delineate the teaching act.

Among them are the following:

First, combinations of two or more teaching skills that can be logically combined and that, as a result of this combination, appear to have an increased potential for affecting learner performance. For example: the combination of proportions of higher-cognitive-level questions, probing, prompting, and redirection into a "repertoire unit" to be studied in toto.

Second, profiles of behaviors as used in response to learner input. This view of teaching skill, which builds upon Nuthall and Lawrence's work (1965), considers qualitative measures of appropriateness of the behaviors used as well as quantification of those behaviors. Teaching behavior is therefore studied only in relation to the learner behavior that precedes it. The repertoire unit is defined as the set of teaching behaviors that may appropriately and effectively follow various types of learner acts.

Third, a sequence of teaching behaviors (in this instance one might think of them as instructional moves) required to achieve a specified learning (e.g., the skills sequence in Taba's teaching model, 1966).

Research on the effects of repertoires of teaching skills upon learning outcomes needs to proceed simultaneously along at least two lines: (a) to identify significant repertoire units, and (b) to validate those units that can presently be described and operationalized.

Inasmuch as identification of significant repertoire units may be considered a task for Approach 4.1, the programs suggested in that Approach should be applied to this program. It appears, however, that this particular research need will be served best by combining in a single effort at least two of the programs suggested in 4.1, e.g., a research project that incorporates both conceptual-analytic and natural variability procedures. In this way, logical units can be considered at the same time the feasibility of their use in the "real world" is tested.

Once a repertoire unit has been defined, experimental studies may be proposed to delimit the critical elements of the unit by manipulating the presence and form of use of the elements. Secondary analyses of previous studies of teaching can also be conducted. In these analyses, various repertoire units may be generated from existing data. Reanalysis then may be carried out to determine whether this new skill unit produces new and significant information.

Criteria for Evaluating Projects. The following four criteria are suggested for judging projects in this program:

First, the clarity and relevance of the procedures proposed for identifying and measuring the repertoire unit. If this is to be done through experimental research, the operational definition of the unit is critical.

The means for making the unit observable and measurable must be explicated in the project proposed. The relation of these units to proposed learner outcomes should be discussed.

If the research strategy is based upon secondary analysis, the proposal should indicate what new repertoire units will be studied, how these will be derived from the existing data, and how they relate to the learning outcome included in the original study.

Second, the appropriateness of the research methods to be employed in manipulating and studying teacher use of the repertoire unit.

Third, the relevance to common educational practice of the treatment conditions (instructional setting) in which the unit will be studied.

Fourth, the extent to which the research plan will provide information regarding the trainability of the repertoire unit (if it is proven effective).

Illustrative Projects. Projects 4.2.6.1 and 4.2.6.2 illustrate the types of projects included in Program 4.2.6.

Project 4.2.6.1: Determine the Effects on Learning Outcomes of a Teaching Strategy Combining Higher-Cognitive-Level Questioning, Prompting, Probing, and Redirection. Research on clusters of skills is important as the effects of teaching skills may be lost if too small a sample of teaching is used. This project provides a means of determining the most significant measure of teaching in an important skill area -- teacher questioning. Considerable research exists regarding the proportion of teachers' questions which fall in factual categories as against higher-cognitive-level categories. Limited research has been done to study the effects upon learning of variations in teacher performance of this skill.

Theoretical discussions of teaching suggest that prompting, probing, and redirection are teaching skills that encourage higher-cognitive-level responses by learners. See the reviews of research on questioning by Dunkin and Biddle (1974) and Brophy (1973).

The specific objective of this project is to determine effects upon learning outcomes of teacher use of higher cognitive questions without the support of follow-up teaching skills and with these supporting skills.

The specific action plan would include: (a) developing and testing a semi-programmed instructional unit that controls both the proportion of higher-cognitive-level questions to be asked by teachers, and teacher use of the supporting skills of prompting, probing, and redirection; (b) developing measures for relevant learner outcomes; and (c) designing experiments on the effects of different proportions of higher-cognitive-level questions and the presence or absence of supporting teaching skills.

Project 4.2.6.2: Examine the Effect of Teaching Skills Repertoire Organization and Sequence on Outcomes in Pupil Achievement and Attitudes.

Most studies that have examined effects of teaching skill(s) on pupil outcomes look at very small, discrete units or sets of skills. Most of these studies have failed to demonstrate empirically that the skills in question have an appreciable effect on students. The small units and restricted nature of the skills examined may have caused the lack of effects. Thus, there is a need for studies that examine the potential effects of broad sets of skills that are linked together into a conceptual whole.

The specific objective of this project is to test simultaneously the effects of: (a) sets of teaching skills, and (b) repertoire organization, sequence, and application at selected times. To conduct this project, five sets of teachers will be trained to utilize superordinate skills as they teach an instructional unit of two weeks' duration. Four clusters of subordinate skills will be tested (as shown in the chart below). Thus, one set of teachers will be trained to utilize all four clusters, whereas the other four treatments will each lack one of the clusters. The independent variable is the presence-absence of any superordinate cluster of teaching skills and the dependent variable is pupil outcomes in reading. Concomitantly, to determine the effects of subordinate skills within the superordinate clusters, observers will describe the presence-absence of subordinate skills within clusters. The steps involved are to: (a) develop reliable instruments that measure the presence-absence of desired pupil and teacher behaviors, (b) train teachers to criterion levels in their separate treatments to which the teachers will be randomly assigned, (c) train observers and check for their reliability, and (d) observe and describe teacher behavior and pupil outcomes.

Treatment	Subordinate Clusters
1	2 - 3 - 4
2	1 - 2 - 3
3	1 - 2 - 4
4	1 - 3 - 4
5	1 - 2 - 3 - 4

SUMMARY

Panel 4 was concerned with research aimed at the improving the ability and tendency of teachers to perform the skills conducive to student achievement of educational objectives. Two Approaches were identified: the identification of important skills and the training and validation procedures that would demonstrate the relationship of the skills to educational outcomes.

The Approach concerned with the identification of teaching skills was formulated in terms of three programs, each oriented toward a different way of identifying such skills. The first of these would use theoretical statements drawn from psychology, human development, pedagogy, and theories of subject-matter instruction. These statements would be reduced to operational definitions of clusters of skills, which would then be identified empirically in teacher behavior. This approach to skill definition is open in the sense that it permits introducing new sets of skills as new ways of viewing education emerge. The second method to be used for identifying skills would depend on observing and analyzing current teacher practice. The practice would be analyzed into skill components. Then an attempt would be made to determine empirically the relationships of these components to educational outcomes. This method would be intended to reveal the significant skills in current teaching practices. The third method for identifying skills would proceed by soliciting the reports of teachers and other persons concerning what they consider to be important teaching skills. This method would identify skills believed to be important in the practice of teaching. In general, these methods do not stand alone. They should be seen as complementary and should be made to converge upon a common set of highly salient skills.

The second Approach, concerned with training for and validating teacher skills--was aimed at determining the transferability of skills as the circumstances surrounding teaching change. Further, it was aimed at identifying the school conditions needed to maintain important teaching skills at an effective level and prevent teachers from slipping into bad practice. Certain theoretical problems were also identified as intrinsic to this line of research. One of these problems is that of identifying metrics by which the elasticity or variability in the effectiveness of teaching skills could be defined. The second problem is that of identifying the scope and nature of the repertoire of skills possessed by individual teachers and relating this repertoire, as a set, to educational outcomes.

The Panel identified specific programs of research and development related to each Approach. Each program includes descriptions of the criteria for judging the relevance of research projects within the program. Brief descriptions of illustrative projects are provided to clarify the Panel's statements about the program. The projects should not be regarded as more than examples of a class of projects to be developed within a given program.

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