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AUTHOR Gage, N. L., Ed.
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ABSTRACT

The goal of this panel was to explore the functions and roles of all personnel involved in new instructional systems which bring to bear advances in learning research and instructional technology. Five "approaches" for achieving this goal arose out of a discussion of the many problems involved in the design and implementation of new instructional systems. The first approach involved investigating the characteristics and effects of personnel roles in the new educational systems. The second approach dealt with the training of personnel for research, development, and evaluation technologies. The third approach was concerned with personnel roles in the school sytem that would receive the new system and the structure and strategies by which the new systems could eventually stabilize themselves. The fourth approach is concerned with delineating the roles necessary for the operation of a newly installed system. The fifth and last approach provides for a series of programs aimed at training persons to assume roles in the emerging instructional systems. (BD)

NIE CONFERENCE ON STUDIES IN TEACHING

PANEL 8

PERSONNEL ROLES IN NEW INSTRUCTIONAL SYSTEMS

GOAL STATEMENT

To explore the functions and roles of all personnel involved in new instructional systems which bring to bear advances in learning research and instructional technology.

PARTICIPANTS

Dr. Susan Meyer Markle (Chairperson), University of Illinois at Chicago Circle

Dr. Eva Baker, Graduate School of Education, University of California at Los Angeles

Mrs. Catherine Barrett, Syracuse Public Schools, Syracuse, New York

Dr. R. Louis Bright, Baylor University, Waco, Texas

Dr. Gerald Faust, Brigham Young University

Dr. Robert Gagné, Department of Educational Research, Florida State University

Ms. Barbara Goleman, Miami/Dade County Public Schools

Mr. Melvin Leasure, Oak Park Public Schools, Madison Heights, Michigan

Dr. Gaea Leinhardt, Learning Research and Development Center, University of Pittsburgh

Dr. Harold Mitzel, College of Education, Pennsylvania State University

Mr. Charles Santelli, New York State United Teachers

Dr. S. Thiagarajan, Center for Innovation in Education of the Handicapped, Indiana University

Ms. Linda Crnic (Secretary), Psychology Department, University of Illinois at Chicago Circle

Washington, D. C.

July, 1975

N. L. Gage, Editor
Kent Viehoever, Coordinating Editor

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PREFACE

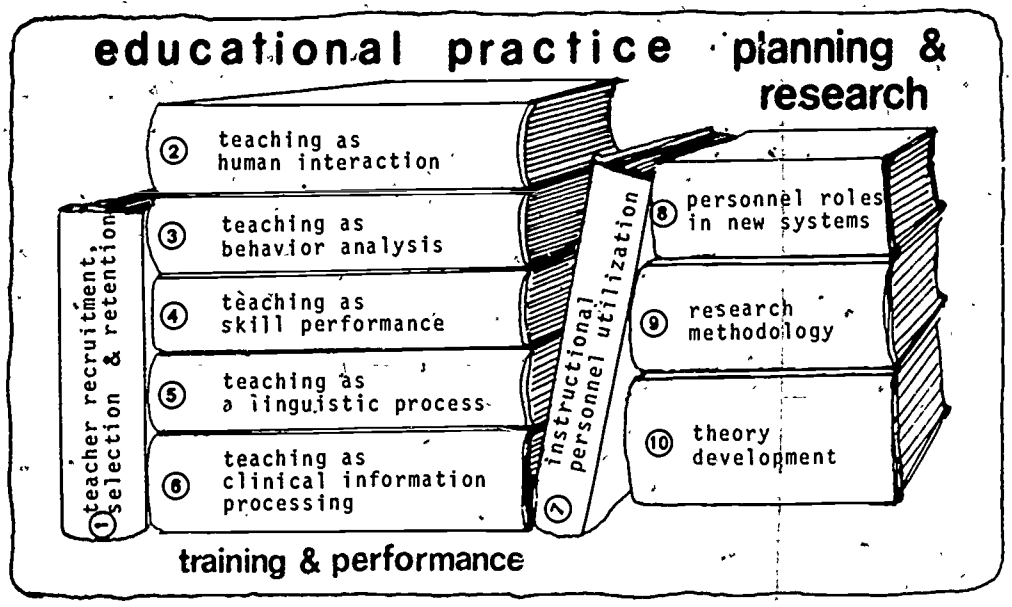
The volume before you is the report of one of ten panels that participated in a five-day conference in Washington during the summer of 1974. The primary objective of this Conference was to provide an agenda for further research and development to guide the Institute in its planning and funding over the 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 protion 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
National Institute of Education
1200 19th Street, N. W.
Washington, D. C. 20208

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. McDaniels
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

Panel Area Goal

The goal of the National Institute of Education in supporting research on personnel roles in new instructional systems should be to explore the functions and roles of all personnel involved in new instructional systems which bring to bear advances in learning research and instructional technology.

In discussing the goal, Panel members stressed the point that teachers may serve many roles in new instructional systems, e.g., roles as manager, designer, motivator, and trainer of paraprofessionals. These roles reduce the emphasis on the teacher as classroom presenter and as discussion leader for whole age-graded classes. Since other panels dealt with more traditional systems and roles, the Panel restricted its discussions to roles and functions in emerging or potential new systems.

The term instructional system is intended to refer to a large-scale, thematically consistent, comprehensive arrangement of instructional materials, techniques, and personnel designed to achieve a particular goal. For an individual school system, a new instructional system is defined as any system which necessitates a change in the role of individual teachers. Examples of presently active systems include Individually Prescribed Instruction, Individually Guided Education, differentiated staffing patterns, the employment of parent paraprofessionals and student tutors, and system-wide television delivery.

Although hardware technology is sometimes considered essential, the Panel took the position that hardware--whether computers or television--is not a necessary component of an instructional system. (See S. Tickton, Ed., 1970, for a similar definition of instructional technology.) Futuristic designs for systems will undoubtedly take advantage of the computer's information processing capabilities and the capacity of new media technologies to extend instruction beyond classroom walls.

The definition of the Panel's problem area would not include changes, such as the introduction of a new curriculum or the addition of a computer-assisted drill laboratory, which leave the role of the

teacher unchanged. In discussing the problem area, the Panel recognized that new instructional systems would of necessity, given the climate of the times, aim at reducing costs and increasing the efficiency of the overall system. The Panel in no sense intended such obvious generalities to imply any attack on the productivity and salary level of teachers in present systems. Accountability, a concept discussed late in our deliberations, was to be applied to the system as a whole, whether traditional or new.

The problem of preparing persons for new roles has strong implications for changes at higher educational levels. Assuming that NIE's primary concern at present is with elementary and secondary education, the Panel questioned the relevance of suggested research programs concerned with education at the college level. For example, the Panel was concerned about how teacher trainees would learn new techniques if those techniques were not modeled for them by their trainers. It would be hard to change teacher education if reform were confined within schools of education, because teachers receive their subject matter training from professors throughout the university. The teachers on the Panel wanted the Panel to address teacher training because they see a trend toward moving teacher training outside the college or university. They preferred to see such training remain inside the college or university because they are increasingly being asked to be accountable for the performance of members of their own profession. Such accountability will, however, be impossible without some control over the entry of persons into their ranks.

The Panel recommended that the implementation of any program in this area should involve two types of analysis fundamental to instructional technology--needs analysis and evaluation of effects. The first requires an intensive survey of the existing state of affairs and of the attitudes and preferences of all involved personnel regarding the changes proposed. The second requires evaluation of the effects of projects on everyone concerned; this evaluation would include monitoring the processes resulting from a new procedure or program and measuring its various outcomes.

The Panel's thinking was guided by the formulation diagramed in Figure 1. Its axes represent (a) types of personnel presently employed or required at future dates; (b) functions basic to instruction which may be assigned to various personnel; and (c) types of systems, known or conceptualized.

General Discussion of Approaches

The Approaches for achieving the Panel's goal arose out of discussion of the many problems involved in the design and implementation of new instructional systems. Of primary concern were factors, now known or identifiable through further research, which lead to the failure of innovations. (The two-volume work edited by Tickton, 1970, contains many

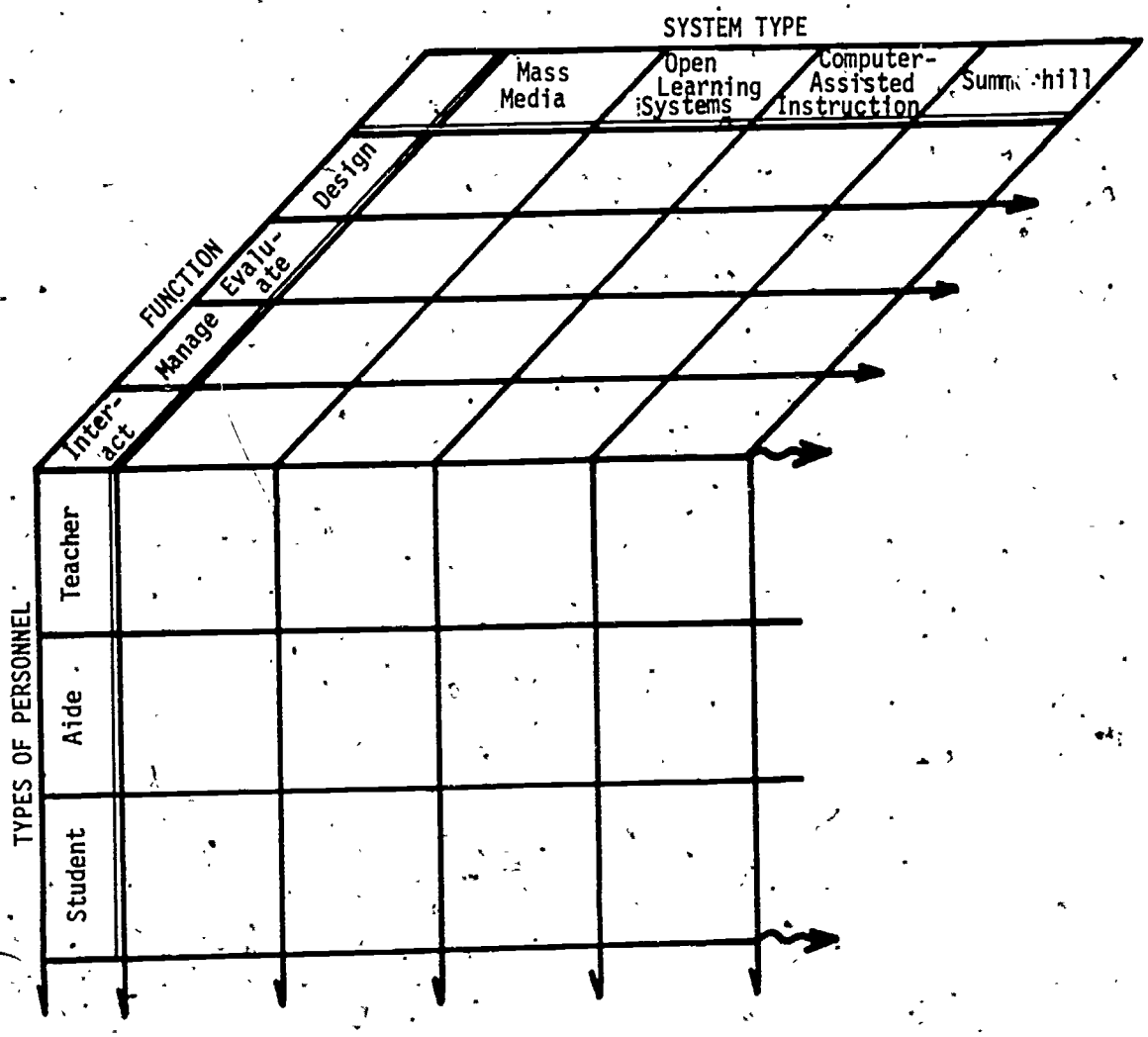


Figure 1. Dimensions of Problem Area 8

insights from the late 1960s.) As focused on by the Panel, such factors include:

1. The political, social, and other constraints which force innovations to conform to existing modus.
2. The lack of established avenues or mechanisms providing effective practitioner input into the processes of problem identification, materials and procedures development, and evaluation.
3. Existing decision-making structures and installation strategies which may obstruct rather than facilitate the introduction of innovative systems.
4. The need for identifying and specifying the continuing roles and functions necessary to operation of new systems once installed.
5. The need for training for new roles in emerging systems.

These considerations led respectively to the five Approaches finally formulated by the Panel.

Different methods for breaking Approaches into programs were also discussed. One possibility was to look at each suggested Approach in terms of three subdivisions: (a) systems in which technology was an integral part of the system affecting all operational facets; (b) systems in which technology supplemented the existing system, which would remain essentially intact; and (c) open learning systems, to which technology is in many cases peripheral. Technology was defined in the broadest sense to include any delivery system, not limited to hardware. Another possibility was to classify the innovations to be studied in terms of whether they were to be introduced into existing operating systems of a more or less traditional sort or were to represent totally new systems, designed and constructed outside the existing system.

In the final analysis, Panel 8 developed five Approaches to its goal, each divided into programs on a basis distinctively appropriate to that Approach rather than on a single basis projected across all Approaches. Approach 8.1 separates systems development into planning and implementation aspects. Approach 8.2 differentiates roles in terms of the R, D, and E process. Approach 8.3 distinguishes between the decision-making structures and the installation support strategies affecting the introduction of new systems. Approach 8.4 is divided in terms of types of systems, and Approach 8.5 according to level of personnel.

The programs and projects which follow from each of the Approaches could be applied to all levels of education, including the university and continuing education levels It was noted that teacher training, taking place on the university level, had effects on the behaviors of teachers in the lower levels of the educational system, and therefore, although the Panel was primarily concerned with the elementary and secondary levels, the university system could not be overlooked.

APPROACH 8.1

INVESTIGATE THE CHARACTERISTICS AND EFFECTS OF PERSONNEL ROLES AND FUNCTIONS IN MODEL NEW INSTRUCTIONAL SYSTEMS WHICH ARE SET UP IN ISOLATION FROM THE USUAL CONSTRAINTS IMPOSED ON INNOVATIONS WITHIN EXISTING SYSTEMS OF SCHOOLING, OR ARE USED TO REPLACE EXISTING SYSTEMS

This Approach is concerned with the case in which one deliberately disregards normal political, social, physical, monetary, and other constraints and devises a new instructional system. The system would be a self-contained and separate entity (e.g., a school) which may take wholly new approaches to administration, content, instructional strategy, and other components or activities of the instructional process. The model instructional system should integrate all aspects of schooling so that they are complete, comprehensive, and coherent in administration, content, and instructional strategy.

Such an Approach would be intended to yield totally new ideas as to how to develop educational innovation at the total system level. Although normal constraints are to be disregarded in the implementation of this Approach, it is hoped that it would lead to new approaches and concepts that might be carried out some time in the future.

Several types of systems should be set up to meet these criteria, but priority should be given to systems which are likely to be most acceptable and effective. Therefore, priority should be given to model systems which have the following characteristics:

1. Explicitly adaptive to the individual student's interests, aptitudes, rates of progress, reward preferences, and learning styles.
2. Thematically consistent in its processes and operations for covering all aspects of schooling. Some examples of themes (not necessarily the only or the recommended ones) are:

   a. "Inquiry-oriented" as opposed to "fact-oriented"
   b. Pupil "self-directed" activities as opposed to "teacher-directed"
   c. Open schools.

3. Specific as to its affective goals, with direct rather than indirect instructional procedures for obtaining these goals.

4. Learner controlled in a significant portion of the instructional process, including both content and strategy.
5. Making provision for careful recording of student performance data, which are incorporated into day-to-day diagnoses and prescriptions of instruction.
6. Using new approaches to the determination of curriculum structure and scope.
7. Making extensive use of a variety of media.
8. Emphasizing interactive methods and media of instruction.
9. Incorporating design principles which define and allocate functions to people, things, and equipment with the purpose of optimizing their operations and interactions.

The history of innovation in education is characterized by a "micro" approach. That is, innovations have been limited to small and sometimes trivial components of the total instructional system. For instance, the introduction of a self-paced programed text into a heterogeneous age-graded classroom does not satisfy, except in an extremely primitive way, the requirement of individualization. A single audiotutorial laboratory course or Keller-type PSI course introduced into a university program may generate problems of conflicting requirements and pressures for students whose program of study is otherwise traditional. (Exceptions to this small-scale characteristic are Summerhill, Montessori, etc.) Because of this limitation, the effects of innovations are often hard to separate from the confounding and generally more powerful elements in the existing system. Teachers and administrators are at a serious disadvantage with such approaches to change because they seldom are sufficiently trained to use the new instructional material or processes and seldom have the time or energy necessary to smooth integration of the new component into the existing system. Therefore, innovations often appear to students as obvious departures from whatever continuity there is in the existing system and may even run at crosspurposes with components of the existing system. This conflict can make the novelty effect (positive or negative) an even greater factor in research on innovation.

Program 8.1.1: Develop Plans for Totally New Instructional Systems.

Few projects have attempted to implement totally new instructional systems. Therefore, we should carefully analyze those that have done so--their themes, problems, etc.--and possibly those themes that could be used to develop plans for such systems. Only if we begin to plan for such systems can we truly identify the personnel roles and functions they will require.

Current knowledge in this area is weak. Projects which come close to this one include (a) Summerhill; (b) the Montessori schools; (c) the Vanguard school (Bright, 1972); (d) the S-3A and FIT projects of the Navy in Coronado, California (Faust, 1974); and possibly some alternative schools. All of these projects are private, and few are as totally new and comprehensive as this program calls for or involve this particular high priority approach.

The specific objective of this program is to evaluate present total-system innovations and predict possible future systems as a basis for developing a model that describes (a) the themes or approaches that could be used in organizing totally new instructional systems; (b) the funding, organization, scheduling or phasing, and personnel necessary to establish such systems.

To achieve this objective, the program should incorporate the following steps: First, analyze current and past programs; second, analyze possible themes and approaches; third, develop detailed system planning to include administration, management, maintenance, instructional strategy, staffing, etc.; and finally, study the ramifications of each proposed plan.

The product of this program will consist of several plans with estimates of their potential problems, especially as regards phasing and staff planning, including detailed job or competency descriptions.

Program 8.1.2: Implement One or More Totally New Instructional Systems.

In order to evaluate the kind of plan developed in Program 8.1.1 and the corresponding overall departure from the usual method of studying innovation, we must actually implement one pilot (experimental) project, or preferably more than one.

The specific objective of this program is to implement and evaluate a total-system approach to educational innovation, with emphasis on the roles and functions of personnel within such systems. The evaluation should include the study of both the innovative process and the product (i.e., the system developed). To achieve this objective, the following action plan is suggested: First, select for implementation a theme or plan from those proposed in Program 8.1.1; second, select a site; third, begin staffing for instructional development, selection of the first year's curriculum, and development of evaluation plans and instruments; and, finally, implement the first year's curriculum and begin staffing for the development of the second year's curriculum. This process should continue through the full curriculum.

APPROACH 8.2

INVESTIGATE THE PERSONNEL FUNCTIONS AND ROLES NECCESSARY FOR THE RESEARCH, DEVELOPMENT, AND EVALUATION OF NEW INSTRUCTIONAL SYSTEMS

The Panel agreed in general on the functions to be performed and on the technological basis required for meeting the requirements of the research, development, and evaluation needed in creating new instructional systems. The functions identified include needs analysis, formative and summative evaluation, task and content analysis, media selection and utilization, and, of course, the actual design and development of materials and procedures. (See, for instance, Gagné & Briggs, 1974; Markle, 1969; Thiagarajan, Semmel & Semmel, 1974; Anderson & Faust, 1973.)

The eventual disseminability of the resulting system was seen to be related in some way to input from and consultation with teachers, administrators, parents, and community during the developmental stages. The importance of input from potential employers of the students who would learn from the system was emphasized as a partial curb on the zeal of content experts. The role of the learner as a crucial element in the process of developing instructional materials and systems was agreed upon, since the systems are to be evaluated in large part in terms of their effects on the students. There do exist cases at the higher educational levels in which advanced students are designing instructional materials and methods for beginners. But the role of learners as participants in research, development, and evaluation was not further developed or conceptualized at lower levels of the educational system.

The role of the teacher, trained for and operating in present systems, in producing new instructional materials and procedures was discussed at length. This discussion led to the formulation of potential programs that were related to later more elaborately defined ones. These programs would (a) explore alternative models and roles for problem identification (Program 8.2.1), and (b) explore the degree to which teachers should play a role in developing instructional materials (Program 8.2.2).

Other suggestions were that efforts be made to design programs for investigating the effects on "disseminability" of the size of the package (ranging from small modules to whole courses and multi-grade curricula) as a function of (a) the level of use (pre-school, elementary school, secondary school, or college), and (b) the training of the instructional

personnel who would use the package. Such a program would differ in strategy from Approach 8.1, in that it would investigate smaller segments that might influence innovation without changing the total system in which the segment was to be embedded. It was suggested that we might investigate the relative effectiveness of using teachers as developers or designers rather than as editors or adaptors. It would also be worthwhile to investigate ways of designing new systems so that they would provide satisfying new roles for teachers moving into the new systems from more traditional roles. Such provisions could improve systems implementation since role satisfaction is a factor in the persistence of an innovation (see Approach 8.3).

Another kind of project that was discussed was that of collating the objectives, job descriptions, and matched assessment procedures now in use at existing training centers which are producing instructional designers and instructional evaluators. It was agreed that further attempts to define the roles and functions of personnel for research, development, dissemination, and evaluation (RDD&E) by surveying existing professionals are not required. Recent studies of this nature have been extensively documented in the final report by the American Educational Research Association (AERA) Task Force on Training (Worthen, Anderson, & Byers, 1971), and the summary report of the Oregon studies in functions of RDD&E personnel (Schalock, et al., 1972).

Given the three task areas of problem identification (needs assessment), development of materials and procedures, and evaluation, the Panel found that the projects it was discussing could be categorized as aiming toward:

1. Better instrumentation for accomplishing each of the three tasks;
2. Complete and specific descriptions of the roles involved in each task by surveying what was being done or postulating what could be done; or
3. Descriptions or prescriptions for organizational environments in which the functions could be performed smoothly.

Within the constraints of the available time and context of the conference, the Panel developed two programs under this Approach.

Program 8.2.1: Develop and Evaluate the Feasibility of Establishing a Formal Institutional Component Serving School Districts, with the Purpose of Obtaining Inputs From Teachers into the Identification of R&D Problems.

This problem deals exclusively with roles in R&D problem formulation, not with the execution of the research project. The formal institutional component was defined as any mechanism--a staff position or a role assigned to a staff member--which would maintain the integrity of the function. Teacher organizations would be expected to work with such a person, but, as with the school administration, would not control the functions.

The specific problem is how to involve teachers in the formulation of researchable problems. Teachers' concerns often are perceived as not being taken into consideration by researchers. Another problem is how to bring the research person's wider experience to bear to prevent "reinventing the wheel."

The general strategy is to identify a role which could be filled by a person acceptable to various interest groups--not by a person identified with the school administration per se. Such a person would have an important impact on research personnel as well. Perhaps a "council" arrangement would result in the desirable continuing dialogue. The person would not have authority to initiate or veto projects, but would function as the staff of the council. Ideas to be developed include the notion of an independent council whose activities would be jointly supported by school districts and a research organization.

Historically, teachers have participated in research and development in a variety of ways--sometimes they have generated problems of their own, but more often a project is developed from other problem sources without consultation with teachers. Projects within Program 8.2.1 might include the following, all of which would depend on integration with the overall program framework.

Project 8.2.1.1: Develop a Rational Model of Operation for Obtaining Teachers' Contributions to Identification of R&D Problems, and Describe Key Staff Positions with Such Responsibilities.

Project 8.2.1.2: Investigate Arrangements for Obtaining Teachers' Contributions to Identification of R&D Problems in a Large School District, with a Comparable Venture for Cooperative Arrangements in Small Districts.

Project 8.2.1.3: Develop a Formal Needs Assessment Instrument to Enable Teachers to Systematically Feed into the System Their Felt Needs.

Program 8.2.2: Develop and Evaluate Various Models for Obtaining the Participation of Experienced Teacher, with Instructional Development Teams in Formulating and Developing New Instructional Materials.

For purposes of this program, an experienced teacher was defined as one who had had considerable success in classroom teaching in the content area to which a project is directed. A subject matter expert was most likely to be a college professor or content specialist interested in the discipline per se rather than in teaching methodology. The development team would most likely include instructional technologists, media specialists, and others.

The Panel noted that there has been some field experience with this area but that there is need for more organized integrated research. It

was deemed critical to resolve the dispute between developers (instructional technologists) and the teachers and subject matter experts as to the role of the latter two groups in development teams. One strategy would be to study ways of increasing the interaction between developers and teachers.

The component functions in an instructional development team require knowledge of (a) the subject matter or task to be taught; (b) the target population or learners to whom it is to be taught; (c) instructional design principles; and (d) formative and summative evaluation procedures. Various combinations of persons and functions may be enumerated, including the frequent case in which one individual performs all functions in producing an instructional module for his own local use or for publication via commercial channels. The team approach, in which the functions are served by different persons, is most likely to occur in large projects (e.g., the AAAS six-year science program, Science: A Process Approach, 1968), in projects that cut across discipline boundaries (e.g., the Open University interdisciplinary foundation courses, Lewis, 1971a, 1971b), or in projects where complex media are involved (e.g., Sesame Street).

Various procedures in the discipline of instructional technology enable an individual to carry out the component functions with the assistance of various consultants. For Function A above, task analysis procedures enable an instructional developer to obtain many kinds of input from content specialists or master performers of the task, persons who would then not be a part of the production process beyond the initial stages. For Function B, the requirement for tryout of early drafts of instruction on representative learners may be costly if the instructional developer is totally unfamiliar with the population (e.g., their reading levels and cultural backgrounds) but errors in his original judgments should be eliminated if enough developmental testing is done. For Functions C and D, the necessary skills may be acquired if time permits by a person who is a content specialist or experienced teacher (e.g., a faculty member may learn to program a computer for CAI development). Thus there are many potential combinations of persons and skills in an instructional development project.

Experienced classroom teachers, those who have taught the particular content to appropriate kinds of students, should have had many opportunities to observe deficits in instructional materials with which they have worked and to observe the success of alternate or remedial procedures which they themselves have developed to compensate for such deficits. Such teachers should, therefore, contribute in Function B to the efficiency of an instructional team by reducing the amount of revision necessary when tryouts are conducted. On the other hand, there is some evidence (Rothkopf, 1963; Lucas, 1974) that experienced teachers are not good judges of what will work with students, given instructional materials of certain sorts. The question of the potential roles of qualified teachers on instructional development projects remains open. Appraisal is needed of the specific kinds of teacher inputs that are most valuable for the development process, the appropriate timing of these inputs, and their significance for the progress of the team effort.

There are several criteria for estimating the effectiveness of a teacher's contribution; (a) The development process is admittedly a costly, time-consuming one. Any procedure which reduces development time would be valuable. (b) The developed product or products may be analyzed to reveal the particular characteristics or components affected by teacher inputs, and these can be compared in number and quality with products developed without these inputs. (c) Teacher satisfaction with instructional materials may be affected by their own participation. Such an effect, which influences disseminability, may or may not be generalizable to other teachers and decision-makers who did not participate. (d) The effectiveness of the instructional materials in terms of average student achievement or in terms of the range of students who could learn from the materials may be affected by teacher participation in development. (e) Future teaching activities of the teacher may be affected by experience with instructional development procedures.

APPROACH 8.3

INVESTIGATE THE PERSONNEL FUNCTIONS AND ROLES NECESSARY FOR THE SELECTION, ADOPTION, IMPLEMENTATION, AND CONTINUATION OF NEW INSTRUCTIONAL SYSTEMS

In this context functions are categorized as (a) school board functions, (b) management functions, (c) instruction functions, (d) learning functions, and (e) parent and community participation functions.

Concerns within this Approach--including both the study or documenting of existing systems and the initiating of new systems--deal with (a) decision-making structures which lead to or block innovation and change; (b) installation strategies; and (c) dissemination strategies, including demonstrations and distribution of information about potential innovations. Specific programs were developed for the first two of these areas. A primary concern was the possibility of a decision-making arrangement in which information generated by students and teachers could feed back directly to upper-level decision makers as a matter of course, rather than only when requested or initiated from the top. It was also pointed out that it has been extremely difficult to study the long-term effects of change, since so few programs have persisted long enough to be subjected to such longitudinal analysis, given current funding practices.

Among the suggestions for potential projects not further developed, but impacting on the adoption decision, was that existing federal and state regulations be analyzed. The analysis would determine the kinds of regulations that positively influence or retard change, particularly as the regulations relate to the decision-making roles of teachers. A further topic of discussion was the need for study of the functions and roles, especially the motivating and incentive factors, involved in facilitating the success of innovative systems. The role of the principal as problem-solver, communicator to the community, and reinforcer for the teacher was seen as integral to the success or failure of new instructional systems.

The cycle of initial enthusiasm, hard work on the innovation, and eventual return to normal is perhaps too common to have merited much discussion. The Panel went directly to discussion of possible programs and projects.

Program 8.3.1: Analyze and Propose New Decision-Making Structures and Interrelationships among Personnel Necessary for the Adoption, Implementation, and Modification of Innovative Systems in a School or School System in Response to Local Needs.

A decision-making structure is the formalized process by which a school management system goes about making a decision (especially with regard to the adoption of new instructional systems or staffing patterns). The term "school" may be taken to refer to a school of education as well as a secondary or elementary school.

Many innovative programs with excellent potential value for improving instruction die or suffer because a positive climate was not set, especially in terms of communication between administrators and teachers. Decisions have often been made without consulting teachers, whose acceptance and enthusiasm is essential to the success of a new system. Decisions are also frequently made without adequate data about the philosophy, techniques, and implementation difficulties of the innovations. Among the projects which might be included under the program would be a survey of the different personnel linkages and alternative routes by which innovations are now being introduced into school systems. A way that students, especially those below the college level, might be involved in decision-making with teachers in determining the need for and direction of change might be explored.

Project 8.3.1.1: Set Up a Model Decision-Making Structure for Implementing a New Instructional System, Analyze Personnel Roles Performed Within That Structure, and Prepare Materials for Training Appropriate Persons to Perform Those Roles. The discussion immediately above has suggested a survey of the climates in which innovations are customarily introduced, as the first step in instituting more supportive climates.

The specific steps to be followed for conducting this project would include: (a) survey existing programs to identify probable determinants of success and failure, as background data for developing a model; (b) involve professional organizations and other relevant groups in order to obtain a consensus on the definition of the model to be implemented; (c) seek out a community in which the school board, the school administration, teacher organizations, and parents are willing to implement such a model; and (d) implement, monitor, evaluate, and modify the model. The evaluation will be conducted by the groups mentioned above to determine whether the program was implemented as intended and to recommend modifications for the following year.

Program 8.3.2: Investigate the Use of Incentives and Other Support Systems Designed to Increase the Acceptance and Continuation of New Instructional Systems.

A need was perceived for alternative decision-making and support arrangements, in the absence of the funding inducements, extra services, and so forth, that often maintain an innovation only for the duration of the special assistance. The additional costs incurred in implementation and beyond would have to be kept negligible. In higher education settings, such alternative arrangements would involve manipulating

tenure, enrollment reduction, research requirements, and so forth. We need to identify a comprehensive system of contingencies to motivate and maintain desirable behaviors on the part of educational personnel working in new systems at all levels.

Among the potential investigations suggested but not further developed was one to determine the different effects on longevity of a new instructional system of the various roles assigned by it to instructional personnel, particularly teachers. Among these roles at present are relatively passive ones in so-called "teacher-proof" systems, manager roles (with no instructional functions), and completely teacher-mediated roles. It was suggested that feedback procedures might be developed as a potential incentive. Through such procedures, teachers and students could contribute to the further development of instructional methods and materials in non-experimental settings, i.e., after formative testing was completed and the system was essentially "published" and in use in the field. Incentives to be used would, by definition, have to be perceived by the teachers as having value. Among these incentives would be a satisfying role within the system.

Schutz (1970), Hemphill (1970), and others have written of the need for installing change support systems concurrently with new instructional systems. Without modifications in work arrangements, habits, and expectations, the life of new instructional systems is short. New and inexpensive procedures will need to be investigated in terms of their power to produce systems that fit into the settings into which they are installed. Research appropriate to this program can be derived from the fields of organizational development, social psychology, and learning and motivation.

The specific objective of this program will be to study, develop, and test alternative support systems for use with instructional systems. Dependent variables would include user satisfaction, longevity, and instructional system effectiveness. The sequence of research activities would be the following:

1. Identify coherent models for change support.
2. Select support components or total models for development.
3. Decide on size and representativeness of instructional systems for support.
4. Design measures.
5. Obtain sample schools.
6. Institute training and other procedures.
7. Collect data.

The program may be evaluated by means of experimental comparisons of operating support systems, or through implementation and careful analysis of a unique case. During the course of the research, significant decisions would need to be made concerning: (a) models or components of models for support; (b) the class of instructional system that will provide a context for the study; (c) the use of a volunteer or non-volunteer sample; (d) the provision of adequate training procedures; and (e) support for essentially cost-free strategies.

APPROACH 8.4

INVESTIGATE OPERATING INSTRUCTIONAL FUNCTIONS AND ROLES WHICH ARE INTEGRAL TO NEW INSTRUCTIONAL SYSTEMS

The relationship between this Approach and Approach 8.3 was discussed at length, since there appears to be considerable overlap between the two Approaches. Among distinctions that could be made were the following:

Roles Approach 8.3 Deals With	Roles Approach 8.4 Deals With
roles necessary to cause introduction of new systems	roles necessary to operation of the new system on a day-to-day basis
roles necessary to maintaining participation	roles necessary to ongoing instructional activities
change agents (persons involved in diffusion)	persons in consumer groups

An operating system would have to be in existence before analysis of roles and functions and experimentation with variations of them could be undertaken. Hence, Approach 8.4 also overlaps somewhat with Approach 8.1. Where such operating systems exist, surveys relevant to Approach 8.4 are also relevant to Program 8.1.1.

Many projects within the programs of this Approach were suggested. Among those projects were some concerned with the development and evaluation of subsystems, for instance, subsystems involving peer tutoring arrangements. Other projects were concerned with research and development on techniques supportive of the kinds of schooling arrangements implied in the approach. Among these would be the development of performance aids to facilitate continuous monitoring and record keeping by personnel in such individualized systems. There is a need for models of efficient data collection, analysis, and utilization--models which allow instant and regular access to important student records and easy identification of students "in trouble." In conjunction with student records, efficient information retrieval systems usable by teachers are needed to facilitate the location of instructional materials required by individualization strategies. (See the dimensions proposed for individualization in Approach 8.1.)

Programs Related to Approach 8.4

There was considerable discussion as to how to organize this Approach into programs. The alternatives considered were to organize it in terms of (a) the level of personnel, as was done in Approach 8.5; (b) the various functions required for instruction; and (c) system characteristics. The last alternative was adopted. In discussing functions, it was emphasized that students could assume a large number of functions in a variety of systems, with respect to each other's learning and with respect to their own learning. Various non-school persons, such as persons from the community and industry, could also serve personnel functions (beyond that implicit in the paraprofessional function) in instruction.

Instructional functions were subdivided into the following categories:

1. Assessment of learner needs, learning styles, etc.,
2. Evaluation of materials,
3. Diagnosis and prescription,
4. Contingency management,
5. Grouping students for effective instruction, and
6. Group leadership, in small or large groups.

The seven programs were identified and assigned to individuals or small teams for further development. Discussion by the whole Panel was limited because of time.

Program 8.4.1: Investigate the Roles and Functions that are Necessary for Instruction Using Mass (Broadcast) Media.

The purpose of this program is to identify and validate specific functions and roles necessary for the successful implementation of broadcast instruction. Teachers, paraprofessionals, educational broadcasters, parents, and learners working in broadcast-media instructional systems would be involved.

Instructional systems which primarily depend upon radio and TV broadcasts have proven themselves to be cost effective both for supplementary (e.g., Electric Company) and alternative (e.g., British Open University) instruction. Advances in hardware and broadcast techniques (e.g., ATS-F satellite transmission) have made it feasible to provide high quality instruction to the most remote locations. However, broadcast media by definition do not provide individualized (adaptive) instruction. Such individualization is to be achieved through various functions served by teachers and others. This program will form the performance analysis base for which training materials in Program 8.5.2 will be prepared. It is related to Panel Area 7: Teacher Utilization.

Analysis, specification, and validation of roles or functions are essential prior steps in the preparation of training materials for various instructional personnel.

Work done by the Children's Television Workshop (CTW) indicates the need for specific types of intervention from teachers and parents. Pilot work has also been done by the CTW to specify parent roles and functions in following up their Sesame Street broadcasts. Studies at the British Open University and the Australian Broadcasting Commission provide useful information. Work on remedial tutoring functions by such investigators as Ellson (1970) suggest applicable new techniques for augmenting printed materials. No systematic work in the program area of identifying generalizable functions for ancillary personnel has been undertaken.

Skilled researchers are available as well as broadcast media organizations (e.g., the National Association of Educational Broadcasters) to provide facility resources.

The Panel recommended that the following steps be included in the action plan:

1. Analysis of existing data; assessment of needs of consumers of broadcast instruction; survey of current practices within and outside the United States.
2. Identification of functions and roles suggested by existing and anticipated broadcast instructional systems.
3. Design of alternative systems of ancillary instructional roles for broadcast instruction; specification of personnel required and their roles.
4. Pilot testing of alternative systems (formative evaluation).
5. Summative evaluation and final reporting.

Mass media form a major component of many new instructional systems. They require instructional roles and functions that are significantly different from those that currently exist. This program appears to be integral to the attainment of the goals of this Approach, and should be completed before production of training materials on the use of broadcast instructional systems (cf. Approach 8.5). Formative and summative evaluation should be built in through measures of various outcomes in teacher and student behavior, including attitudes, preferences, achievement gains, and motivation levels. Two constraints which were cited are lack of communication between teachers and broadcast technologists, and overemphasis on hardware development in the broadcast field. However, researchers with expertise in both instruction and broadcast technology are available. It is expected that this program will facilitate large-scale adoption of cost-effective and efficient instructional systems of proven quality, especially in remote and rural areas.

Program 8.4.2: Investigate the Roles and Functions Necessary for Instruction in Open Learning Systems.

The objective of this program is to study facilitative roles and functions for the successful operation of open learning systems. Teachers, aides, and students are the groups that will be affected.

Many open learning systems develop, but few survive; personnel roles in such systems have not been systematically studied, and the short life of open learning environments may be attributed in part to the extraordinary expectations placed upon the teacher. Some projects have been conducted that provided for the flow of personnel from the community and from the home into the classroom.

This program involves the investigation of the roles and functions necessary for instruction in open learning systems. It is related to needs in training of the kind dealt with in Approach 8.5. Specific steps for conducting this program include the following:

1. Through the study of existing alternative open learning systems, identify roles for school personnel, potential industrial and professional persons, parents and community members, and pupils; and
2. Select, design, and test alternative roles in terms of participant satisfaction and extent of "openness" as judged by experts.

Key decision points identified by the Panel are: (a) the development of alternative models, (b) the development of criterion measures, and (c) the collection of data from unobtrusive measures. For the evaluation, the Panel recommended a case study approach with rich and varied sources of data. Expert judgment, learner performance, and participant satisfaction were cited as appropriate outcome measures.

Two difficulties noted were that (a) the notion of research is often considered antithetical to open learning programs; and (b) the notions of "system" and of "open learning" are often perceived to be incompatible by proponents of each viewpoint.

Program 8.4.3: Investigate Roles and Functions Neccessary for Incorporating Computer-Assisted Instruction.

The objective of this program is to investigate and optimize personnel support functions and roles for applications of computer-assisted instruction (CAI) in a variety of instructional situations. The research findings from this program would be of primary importance to the designers of new instructional systems (Approach 8.1) and to planners of training programs for educational personnel. This program should be applicable over a broad span of learners from primary level through adult education. Resource material from the TICCIT project is probably the best source (see article by Faust, 1974). No known empirical comparative studies of different personnel support systems for the same sets of CAI applications exist.

In the past few years we have seen substantial advances in the development of prototype hardware and software for CAI. These technological and curriculum advances have outrun the organizational and manpower structures necessary for CAI in real settings. There is a marked need for

empirical testing of several different conceptions of CAI manpower with standard types of hardware, curriculum, and pedagogy.

Specific steps for carrying out such a program include the following:

1. Survey and classify major types of CAI operating personnel plans according to pedagogical strategy (i.e., maintenance or supplementary), target groups (i.e., primary school through adult), and instuctional theme (i.e., inquiry, skill development, etc.);
2. Invite proposals from the research and development community with access to various kinds of systems; and
3. Award grants on a competitive basis to the most promising proposals. Five to ten projects in the area should be funded.

One constraint was noted: Relatively few schools or colleges have a currently functioning CAI system, in which different roles for personnel could be experimentally manipulated.

Program 8.4.4: Investigate the Roles and Functions that are Necessary for Educational Settings Which Use Combined Instructional Components.

The objective of this program is to examine the roles and functions which are required by systems which use more than one technique to achieve one or more educational objectives. This program would use the findings of projects from other programs in this Approach.

Education is now at a point where several reasonably successful approaches have been identified and used. Most approaches, however, stress one particular type of outcome. To expand the range of outcomes, it would be useful to support programs which use more than one technique. This requires, however, that careful analyses be made of all educational roles required by the several innovations.

The Panel recommended that an already established innovative system be merged with a component of another system. If such an approach is used, the following steps might be appropriate:

1. List intended and unintended outcomes of the current system and examine the current and projected roles which are required by the system (not the staffing estimates),
2. Select an alternative system that could be expected to add to the degree or kind of outcomes and examine its role requirements,
3. Use role projections to design the personnel staffing pattern of the combined systems,
4. Train persons to fill these roles; and
5. Try out the training program and the combined systems. (Steps 4 and 5 must pay special attention to situations in which existing personnel take on new or delete old roles and functions.)

The main evaluation plan must focus on two questions:

1. Have educational outcomes been increased or broadened or achieved more efficiently?
2. Are the personnel staffing patterns optimal for meeting the new role requirements? That is, do jobs get done, is job satisfaction high? (This question also applies to cases where students assume the functions.)

The possible difficulties noted were the limited availability of freely exportable training systems and of measures of unintended outcomes; and the need to minimize the increase of personnel while still increasing the functions served.

Program 8.4.5: Investigate the Roles and Functions Necessary for Instruction Using Individualized Systems.

This program was considered only in the most general terms, but was understood to include a range from the more structured materials-based systems (e.g., IPI, IGE) to more informal tutoring arrangements. Potential projects suggested included the following:

1. Investigate changes in teacher self-perception resulting from a shift to manager role.
2. Develop performance aids to facilitate continuous monitoring and record keeping by personnel in individualized systems.
3. Develop system of peer tutoring (in grades 4-7) with specification of roles of teachers and of techniques for evaluating effectiveness.

As an example, the latter of these was developed into a project; however, the Panel recognizes the various other role changes that may be produced on the roles of teachers, aides, and all other personnel. In view of the close relationships between the specification of roles and behaviors (Approach 8.4) and the specification of the training for such behaviors (Approach 8.5), the project is closely related to Program 8.5.4.

Project 8.4.5.1: Develop and Evaluate a Classroom-Managed System of Peer Tutoring in Grades 4-7, with Specification of the Functions of Teacher and Students and an Evaluation of Effectiveness. A number of evaluative studies of student tutoring, including a few of peer tutoring, have been performed and reported. Almost universally, the reported results have been beneficial to teachers, tutors, and participating students. However, no systematic development of a total system of peer tutoring, applicable across subject areas at a single grade level, has been undertaken. Such a system might well improve student motivation and achievement as well as improving teacher efficiency by allowing more time for critical teacher functions.

The objective of this project, then, is to develop specific materials and products necessary for the installation and evaluation of a system of peer tutoring for the instructional program of a class at the grade 4-7 level. These include operating procedures; a teacher handbook; materials for instructing the tutors; and evaluation instruments. Several of these could be adapted from available materials.

The steps to be taken in carrying out the project include the following:

1. Collect component techniques of student tutoring, including teacher and student procedures and methods of training.
2. Appraise the applicability and relative merit of the techniques as applied to peer tutoring.
3. Design a complete system for peer tutoring, including operating procedures and incorporating component techniques where applicable.
4. Train teachers who will act as implementers or investigators.
5. Install the system and begin tutor training.
6. Monitor the operation of the system and make necessary adaptations over the period of a school year.
7. Collect summative evaluation data.
8. Prepare a report of findings.

Summative evaluation hypotheses to be investigated include the following:

1. More positive teacher attitudes.
2. Student attitudes more favorable than those in conventional classes.
3. Student achievement raised in comparison to conventional classes.
4. Reduced absenteeism and tardiness.
5. Greater frequency of heightened student motivation.

Program 8.4.6: Develop and Evaluate Novel Component Techniques Involved in the Roles of Instructional Management, Presentation, (Local) Design, and Evaluation.

Total instructional systems involving novel components include (a) mass media systems; (b) open learning systems; (c) CAI systems; (d) integrated combination systems; and (e) individualized systems. In all of these, it is possible to identify specific instructional components which become parts of roles for the teachers who operate these systems. These components include: (a) diagnostic testing; (b) learner progress recording; (c) learning task analysis; (d) matching materials to learner needs; (e) managing instructional events; (f) operating a learning resources center; (g) scheduling the use of materials; and (h) managing peer tutoring.

Evidence from evaluations of new instructional systems often indicates the need for further development and refinement of existing techniques. For example, the IPI system has tried out and refined several different techniques for diagnosis and prescription. For another example, mass media methods of instruction will require new techniques of monitoring students' progress.

Panel 8 cited the following justifications for this program: (a) new component techniques are often suggested by the operation of new total instructional systems; (b) developing and testing the effectiveness of components is often a more economical approach to improving the total system than doing so only for the system as a whole; (c) separate testing

and refinement of component techniques can in many instances be carried out independently of a total system and more effectively.

The specific steps for carrying out the program include the following:

1. Define clearly the component technique and its use within the system or systems to which it relates.
2. Design a study of teacher functions in using the technique within an appropriate instructional setting--a class or school.
3. Collect data on the feasibility of the techniques and their effectiveness in terms of learning outcomes.
4. Report results in terms of feasibility, effectiveness, and implications for teacher functions in the setting of various new instructional systems.

Program 8.4.7: Survey Differentiated Staffing Projects and Develop Models of Differentiated Staffing.

There is a need to study the current status of differentiated staffing, with an eye to determining those programs which seem most successful in terms of duration, staff satisfaction, and impact on students. The purpose of the study would be to develop a model for building future staffing patterns that reward skilled teachers, individualize instruction, and provide for shared decision making. There is a critical need to retain good teachers by providing the rewards of job challenge, additional remuneration for added responsibility, and increased teacher (and student) participation in decision making.

The sources of current knowledge and information in the area of staffing and model development include the following:

1. U.S. Department of Health, Education and Welfare, The Educational Professions 1971-1972: Part II, Differentiated Staffing: A State of the Art Report, U.S. Government Printing Office, February 1973.
2. National School Public Relations Association. Differentiated Staffing in Schools (Education USA Special Report). Washington, D.C.: National School Public Relations Association, 1970.
3. Data from the Smithsonian Institute.
4. National Federation of Teachers position papers.

One important need in this program would be to communicate to professional teachers' organizations that such programs need not be "merit-pay" systems, ways to save money, or means to establish further vertical structures (hierarchies) within school organizations. Representatives of teachers' organizations should be included in planning and research.

Specific steps in carrying out this program would include the following:

1. Identify exemplary programs.
2. Discover why some programs collapsed and some continued,

3. Build a model for installation in several experimental schools, and
4. Install the model and maintain a supervisory-monitoring-modification process.

APPROACH 8.5

INVESTIGATE THE WAYS IN WHICH PERSONS CAN AND SHOULD BE PREPARED FOR NEW ROLES AND FUNCTIONS

The Panel noted that training as a topic cuts across all Approaches listed earlier but decided that the Approaches could not be completely non-overlapping. Some programs and projects mentioned earlier will, therefore, be closely related to this Approach.

The thinking of the Panel was guided by a three-dimensional matrix, generated from a sorting of relatively concrete projects developed early in our deliberations. One dimension of the matrix was the type of project being suggested: (a) an analysis of the job (needs analysis or task description); (b) a survey of existing materials, procedures, and assessment instruments relevant to the various jobs; and (c) development of materials needed to produce skilled trainees. A single project might include all three activities, in that order. The second dimension of the matrix was the target trainee population, including (a) designer or evaluators, (b) pre-service teachers, (c) in-service teachers, (d) administrators, (e) paraprofessionals, and (f) students. The third dimension was the instructional task to be performed: (a) diagnose, (b) design, (c) evaluate, (d) manage, and (e) adapt.

Of the 30 cells possible in the combination of persons to be trained and tasks; not all would seem plausible. Neither administrators nor paraprofessionals would likely be involved in the "fine tuning" or local adaptation of new instructional systems. The instructional designer would be unlikely to become a manager in an ongoing classroom. The matrix, however, suggests a larger number of possibilities that were not further developed.

Among ideas worthy of further consideration were several in the area of "fine tuning" or adaptation of new systems to local conditions. Strategies for monitoring the changes and adaptations introduced in the field would yield data relevant to differential effects on learners of the adaptation and also data on the relative cost effectiveness of the original as against the changed design. A need was suggested for consensus on a job description of the relatively new role of evaluator as the person responsible for adoption or adaptation decisions in existing school systems. Among projects that might be developed in the training of instructional designers was the investigation of the competencies required to adapt materials not based on technology, such as standard

texts and passive media materials, to the requirements of systems based more on technology. The adaptation would involve specific objectives, criterion-referenced evaluation, learner activity, and individualization.

A theme mentioned earlier arose several times in discussing this Approach, namely, the possibility of evaluating the effects of innovative training, pre- and in-service, on teachers' "innovation approach behaviors." This theme is related to one potential effect, considered in Approach 8.2, of involving teachers in instructional design projects. Such involvement might affect their other in-class behaviors even though little time would be available to them on-the-job to invest in instructional development. Alternative patterns of released time to permit instructional personnel to develop or adapt systems and modules could also be investigated, in terms of training required and cost effectiveness.

The Panel developed some of the cells in the matrix into program and project descriptions. In the following section, four programs are discussed.

Program 8.5.1: Develop Methods of Training for Local Adaptation of New Instructional Systems.

Evidence regarding the status of innovation in education is dismal. Goodlad and Anderson (1963), in a series of studies of schools, found little implementation of new programs, particularly after financial and psychological support from the development agency has been withdrawn. Among possible explanations for these failures are the following:

1. The programs have not been developed to the degree that they are truly transportable to sites other than those in which validation trials were conducted.
2. Teachers do not at present possess skills that would permit them to adapt materials to the local setting while maintaining desired outcomes.
3. The imposition of systems from outside agencies without real contribution by the expected system users results in a lack of commitment to implement and continue program use.

Program 8.5.1 would seek to support projects that addressed the issue of local adaptation and contribution in the context of training. "Training" and "local adaptation" are defined for this program as follows:

Training is the development and implementation of exportable strategies for producing competencies relevant to the program. Components of such training should probably deal with instructional and evaluation skill areas. Training may be administered through any mode, e.g., seminars, workshops, media, or any combination. The only constraints are that replicable training systems will have undergone

appropriate evaluation. Training may emanate from any agency but should involve verification of training goals with development and evaluation experts.

Local Adaptation is the modification of instructional systems to meet requirements of setting, personnel, and learners that are substantially different from those on which the instructional system was validated. Such adaptation could take the form of the addition of instruction, the modification of instructional strategies, and the identification and remediation of undesirable program outcomes. The major purposes and basic structure of the installed program would be retained. Even when adaptations seem to be appropriate for goals and basic strategies, the new system may have been inappropriately adopted. Marginal adaptations are considered to be appropriate.

The supporting framework in regard to local contribution derives from the areas of social psychology and instruction. Evidence from studies in commitment, persuasion, and effective change suggests that the target audience must be encouraged to participate in the process rather than be cast in the role of a receiver. Watson (1967), in his studies of resistance to change, outlined propositions designed to facilitate acceptance of innovation: Principal among these is the need to promote a sense of collaboration among participants in innovative projects. The act of contributing to the local modification of a program would be expected to help foster the personal commitment of teachers to the system.

A related consideration is that the current state-of-the-art in product "validation" is relatively weak. There are only a few instances of widespread representative testing of new systems. Thus, one would expect that innovations will require some adaptation to local constraints if the systems are to function competently.

With regard to instruction and training, there is evidence to support the notion that principles of instruction and formative evaluation can be taught to teachers, that these behaviors persist over time, and that these skills are correlated with increased performance by students. The existence of training materials in the areas of instruction and evaluation (developed with support from NIE and other organizations) suggests that this program is feasible without the mounting of major development efforts. Thus teachers could be provided with the skills required to modify instruction, rather than acting merely as recipients, resistors, or rejectors of new systems.

A suitable means for determining the effectiveness of such training would include comparisons with randomly selected untrained volunteer schools. Appropriate measures for assessing the results of training would include:

1. Observable changes in personnel skills with respect to instruction and evaluation.
2. Extent of system implementation and effectiveness in instructional settings.

3. Degree of satisfaction with the system on the part of all participants.
4. Degree of participant receptivity to new systems for installation.
5. Measurement of student achievement and attitudes.

Such a plan represents a departure in the area of training since the dependent measures relate to the long-term effects on receptivity to innovation, in addition to the usual goals of system effectiveness. The program could be carried out concurrent to studies investigating decision-making changes or incentive mechanisms.

The following steps are recommended for carrying out such a plan:

1. Identify critical components of training goals and strategies.
2. Locate, obtain, and modify materials or procedures.
3. Pilot test the training.
4. Identify and train instructors to conduct adaptation training.
5. Concurrently with Step 4, identify the sites for participation.
6. Develop measures of outcomes of the training.
7. Institute the training.
8. Assess short-term effects in terms of skills.
9. Assess long-term effects in terms of system continuation, receptivity to other programs, etc.

The Panel recommends that at least four such parallel projects be funded in different localities for a three-year period. Limiting considerations are that:

1. Ideally, populations for training would involve districts where new instructional systems were about to be installed.
2. The school would be the unit of training.
3. Randomization of training for volunteer schools would be desirable.
4. Provisions for possible extension of the three-year funding period would be ideal.

Program 8.5.2: Develop and Evaluate Alternative Models of Teacher Training for Roles and Functions Emerging from New Instructional Systems.

For purposes of this program, teachers are defined as certificated or otherwise qualified instructional personnel, the primary operators of new systems, interacting with students. Teachers are considered to work with learners in pre-school, elementary school, secondary school, and post-secondary school settings.

The roles and functions of teachers operating new instructional systems are expected to differ radically from model behaviors in "traditional" instructional environments. Alternative roles and functions cannot be accomplished by mandate; rather individuals need to be given the opportunity to integrate new habits and skills into their expectations and

repertoires. The range of competencies to be translated into training will need to evolve from requirements imposed by new systems, e.g., requirements for a role as instructional manager rather than as presenter of information, or for roles that can extend teachers' normal scope of responsibilities. Such role extensions might include training of other instructional personnel, acting in program evaluation capacities, participating in R&D activities in school and other settings, or assuming alternative decision-making roles with regard to management of school programs.

The objective of this program is to develop and evaluate alternative training models for training teachers in pre- and in-service settings for roles appropriate for the implementation and supplementation of new instructional systems. Toward this end, the Panel suggested the following projects:

Project 8.5.2.1: Develop a Self-Instructional Curriculum for Off-Campus Use for College Credit to Acquaint Principals with the Philosophy, Techniques, and Implementation Problems of Continuous Progress Systems. The objective of this project is to train principals how to successfully implement individualized systems. The principal is by far the key person affecting the success or failure of an innovation. Thus, this training is critical to the spread of individualized, continuous progress systems. Such training should likely be performed by an institution that has had extensive experience in both the development and implementation of self-instructional materials in actual school settings, rather than in conventional curriculum development.

Aspects to be included in the instruction cover such topics as:

- Delineation of new roles of the teachers and other staff members.
- Community relations: the importance of pre-selling of the concept in terms of benefits and goals.
- Parent relations, e.g., form and meaning of report cards.
- Evaluation techniques.
- Importance of keeping detailed records of student progress.
- Careful study of diagnosis and prescription functions.
- Analysis of motivation problems and techniques.
- Introduction to the literature.
- Various curricula commercially available and characteristics of each.
- Teacher training requirements and techniques.
- How to solve problems as they arise.
- How to modify and adapt systems.

Project 8.5.2.2: Analyze Common Attributes of New Instructional Systems and Develop Training Materials for the Training of Educational Personnel. Many of the "new" instructional systems (PLAN, IPI, and IGE) are being adopted extensively. Training time for teacher-managers on the implementation of these (or other newer) programs can be considerably reduced by the outcomes of the proposed project.

The Panel recommended the following specific steps for the action plan:

1. Locate and retrieve major instructional system materials;
2. Analyze and classify common attributes of these systems;

3. Design instructional package on knowledge and skills suggested by the analysis;
4. Formatively evaluate and refine the package; and
5. Summatively evaluate.

Project 8.5.2.3: Survey Teachers' Centers to Determine Most Effective Decision-Making Structures Leading to Successful Innovative Programs. The specific objective of this project would be to provide essential information and guidance toward the establishment and operation of successful teachers' centers supply inservice training to teachers. (No specific action plan was developed for this project.)

Program 8.5.3: Develop Methods for Training Paraprofessionals and Parents in the Instructional Functions and Roles that are Integral to New Instructional Systems:

In many of the new instructional systems the basic teaching decisions are incorporated in the design of the materials themselves. These systems are designed to be "teacher proof" and can be easily implemented by paraprofessionals with limited but specific training. There are indications that trained teachers do not particularly relish having their behaviors programmed and that they manage to circumvent designer-imposed constraints with a resultant loss in efficiency. It is instructionally and sociologically advantageous to use specialist technicians at a level lower than that of the teachers. For purposes of this program, paraprofessionals are defined as teachers' aides who have a specified or implied instructional and management role in the classroom.

One major approach to individualization of instruction has been the use of paraprofessional tutors (e.g., Ellson, Harris, & Barber, 1968; Boutwell & Van Mondfrans, 1972). These tutors are usually recruited from volunteer groups and from low-education levels. Minimal training of the tutors plus well-structured materials appear to compensate for their lack of teaching experience.

Paraprofessional follow-up on instructional broadcasts (e.g., bush radio in Australia) and telecasts (e.g., Sesame Street) appears to provide a cost-effective combination. Studies in this area, including those done at the British Open University system (Lewis, 1971a), suggest that non-specialist tutors perform an important function in providing a more coherent and individualized instruction by closing the gaps in broadcast instruction. The competencies required by such paraprofessionals have not been systematically analyzed. Parents perform this adjunct tutorial role with telecast instruction for pre-school children.

Surveys of parent attitudes toward the schooling of their children (Gallup, 1971) reveal a high level of parent motivation to help their children achieve better academic gains. Such motivation is especially high among parents of handicapped children (Bell, 1965; Katz, 1968). A number of simplified tutoring techniques have been successfully taught to parents (Champagne & Goldman, 1972). Many of these techniques are similar to those used for training paraprofessional tutors.

Within the emerging theoretical framework of instructional systems technology, the parent or paraprofessional tutor is considered to be one

component of the total system. All elements of the system (e.g., materials, media, and processes) are integrated with each other and work toward the common mission of enabling the learner to attain prespecified instructional objectives. Within this theoretical framework, the functions allotted to "machine" and "man" components are carefully selected on the basis of their unique capabilities and constraints.

The actual instructional management and tutorial procedures are derivable from a number of available theoretical frameworks. Among the existing systems currently in use are those based on operant theory, concept-learning literature, and Piagetian stages of development.

This program has six objectives:

1. Investigate alternative theoretical frameworks for the training of parents and paraprofessional tutors.
2. Identify entry traits and competencies that predict successful functioning of paraprofessionals and parents.
3. Determine the optimum allotment of instructional responsibilities among instructional materials, media, and paraprofessionals.
4. Develop various techniques for training paraprofessionals and parents to acquire instructional management and tutorial functions.
5. Measure effects of the use of parents and paraprofessionals on achievement gains of learners; analyze their relative cost-effectiveness in comparison to teacher-mediated systems.
6. Establish functional and optimal relationships among classroom teachers, parents, and paraprofessionals.

The rationale for this program is that (a) new instructional systems usually require nonprofessionals to implement them; (b) the use of paraprofessional/parents is cost-effective and sociologically acceptable; (c) parents demand a role in helping their children; and (d) new demands for nonprofessionals have been created by mass media instructional systems.

Steps to be incorporated into the specific action plan are:

1. Analysis of current related information and derivation of basic competencies needed by nonprofessionals,
2. Derivation of a series of interrelated projects,
3. Design of training packages,
4. Formative evaluation, and
5. Summative evaluation.

Program 8.5.4: Develop Various Means By Which Students at Any Age Level Can Be Taught to Perform Main-Line Diagnostic, Managerial, Tutorial, Instructional, and Evaluative Functions for Themselves and Others in an Adaptive Instructional Setting.

For purposes of this program, the following definitions were adopted by the Panel. "Various means" implies a range of methods of instruction from formal programming to informal suggestion. "Diagnostic" refers to the ability to assess entering knowledge and interest and to prescribe appropriate educational experiences to add to that knowledge state. "Managerial" refers to the ability to use, and demonstrate the use of, instructional equipment (from books to computers to human resources), instructional time, space, etc. "Tutorial" refers to the ability to explain to, demonstrate for, and question another student on a specific or general piece of information; in general, it implies that one or more individuals are involved and that subject matter content is the focus of discussion. "Evaluative" refers to the ability to assess degree of success in attaining mastery of the subject matter.

One consequence of individualizing education is to increase the sheer quantity of information which must be processed in order to make appropriate educational decisions. The question then arises as to whether or not it is feasible to have the teacher continue to be the only person concerned with or involved in making these decisions or whether to include others in this function. Students are reasonable candidates for performing some of the functions because they are numerous, do not add to the cost of a program, and, most important, can probably benefit from the experience. If students are to be used in such a way, two things must be done: (a) a careful analysis of classroom functions for specific settings must be made to determine the behaviors required to perform each function (Note: This analysis could be carried out by Project 8.4.5.1 under Approach 8.4); (b) a training program should be designed to teach the above behaviors to students.

All work in programmed instruction is partially relevant to this program. Resnick, Wang, and Rosner (in press) have examined the role of the student in individualized settings and identified some of the basic skills teachers need to exhibit to teach in such settings. Many existing curriculum packages include elements of student control; however, teaching of students to assume cross-curriculum, integrated responsibilities has been limited.

As the degree to which individualization occurs increases, the teacher's burdens also increase. One way of alleviating this burden is to increase the number of individuals sharing it.

The Panel suggested the following steps for inclusion in the action plan:

1. Task analysis of each function,
2. Ordering of tasks within function by degree of difficulty,
3. Construction of instruments for assessing learner states,
4. Design of alternative training strategies,
5. Tryout and revision, and
6. Final revision.

Two possible problems were foreseen by the Panel: (a) a need for obtaining a field setting for the tryouts, and (b) a need for very precise task analysis at lower grade levels.

SUMMARY

The Panel assumed that the school system will change and that the change will be based upon the systems approach. In that Approach, the teacher in a classroom is not a given. Rather, such an approach begins with an analysis of the goals, or output, that the system should achieve. The output is the educated person. Working from the output to what is needed to achieve such an output has generated fair consensus on certain attributes of a well-designed system. These attributes include individualization of treatment according to the student's needs and goals, intensive use of capital in the form of high-quality materials and validated procedures, and staffing adequate to the performance of specified functions. The present system, it is agreed, does not exemplify good design along these lines.

One Approach toward change calls for the creation of totally new educational systems. In this Approach, an attractive alternative to the existing system is offered as a model that inspires other systems to follow its lead. Within this Approach (8.1), one program would provide for a systematic planning of all aspects of an integrated, comprehensive instructional system without interference from policies, procedures, or pressures inherited from existing school arrangements. If the bold new design appeared to be feasible, the second program would proceed to carry it out.

System design may result in a model built outside the present educational system or in drastic changes within present schools. In either case, the development of new instructional systems requires new kinds of personnel trained in instructional technology as an applied science. The second Approach of Panel 8 deals with the training of such personnel for research, development, and evaluation technologies. This Approach would also call for programs involving the interaction between the persons developing the new systems and those working in existing systems. The interaction would be aimed at increasing the responsiveness of research activities to teacher needs and improving the degree to which the resulting research projects could be disseminated.

A third Approach would be concerned with personnel roles in the school system that would receive the new system. The purpose of this Approach would be to select and implement new systems in such a way that stability would be achieved and the new system would take hold after

initial enthusiasm had waned. Within this Approach, several programs outline a democratic decision-making process and a system-wide incentive and support program to encourage willing and adequate personnel participation in the new system.

A fourth Approach is concerned with delineating the roles necessary for the operation of a smoothly installed new system. This Approach is aimed at preparing for new systems that will involve mass media, computer-assisted instruction, integrated multi-media systems, and print-based individualized systems.

The fifth Approach provides for a series of programs aimed at training persons to assume roles in the emerging instructional systems. Where persons already have the necessary skills, incentive systems alone, as in the third Approach, would be sufficient. Where persons possessing the necessary skills are unavailable, it will be necessary to provide preservice and inservice training. Included among the skills not now possessed by available personnel are those required in adapting even relatively well-developed systems (of which few exist) to local conditions, those required in managing new systems at the school-wide level (the principal's role), and those required for interacting with students (the teacher's role). It might also be necessary to provide for training other personnel, such as paraprofessional staff, and even the students themselves as they move into more active participation in the planning and management of their own education.

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