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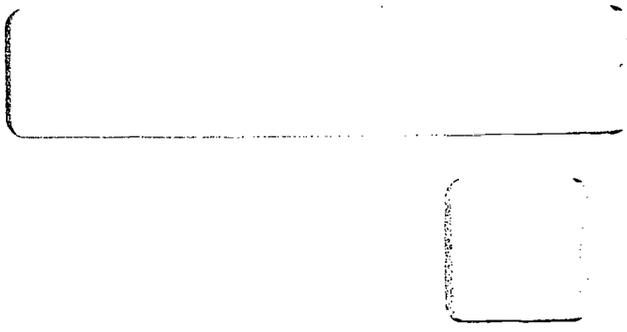
ABSTRACT

These papers are related to the basic comprehensive research and development plan of the Eastern Regional Institute for Education (ERIE). The first paper, Improving Process Education: A Comprehensive Plan by Burton G. Andreas, describes the comprehensive plan and introduces the succeeding papers. The goals of the program are to improve process education in elementary schools by: 1) assisting administrators with the selection and installation of process-oriented curricula; 2) providing, and causing to be provided, the necessary inservice preparation for teachers; 3) monitoring the curriculum installation by offering regular assessment and consultant services; and, 4) using evaluative feedback to improve upon these installation and diffusion strategies. The other papers are: 1) Analysis of Process Curricula, by Henry P. Cole and Albert Seferian; 2) Curriculum Augmentation and Validation, by Henry P. Cole; 3) Curriculum Installation and Diffusion Strategies, by James M. Mahan; 4) Evaluation of Curricular Programs, by Richard C. Wallace, Jr. and Richard Shavelson; and, 5) Variables Affecting Installation by Richard S. Andrulis. References and statistical tables are included. (Author/DJB)



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a series of related papers presented at the 1970 Annual Meeting of the American Educational Research Association by staff members of the Eastern Regional Institute for Education

RESEARCH INTO PROCESS CURRICULA

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Henry P. Cole
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March 1970

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IMPROVING PROCESS EDUCATION: A COMPREHENSIVE PLAN

Burton G. Andreas

Before considering the objectives of the program plan to be described, a few prefatory remarks may be useful to indicate the purpose and scope of this paper and its relation to those which follow. The comprehensive research and development plan with which our series of related papers is concerned is actually the basic program plan of the Eastern Regional Institute for Education during one phase of an evolving effort to carry out the mission of the laboratory. This mission is to improve process-oriented education in elementary schools. Different facets of the work are covered in the reports to follow. It is my task to acquaint you with the framework within which our effort has been progressing. First, we need to examine the broad goals toward which the laboratory's activity is directed.

The objectives of our program are based directly on the educational needs of elementary school children. The years which a child spends in elementary school are years of significant growth and development, both physically and mentally. We see it as a major task for the school to assist each child in acquiring and refining skills and processes in the cognitive, affective, and psychomotor domains. Our conceptualization of this deliberate

promoting of intellectual processes is closest to that of Gagné, although the research, theory, and practices of numerous educators, child development specialists, and psychologists have contributed to our approach.

The work and writings of these scholars--taken in sum--suggest that schools should foster the development and sharpening of a great number of classes of mental processes and skills. Among the target categories an illustrative sample might include attention, observation, classification, inquiry, hypothesis-formation, and clarification of values. This brief list is merely suggestive of areas of concern. We tend to use the terms "process" and "skill" interchangeably, although a rigorous treatment might demand careful definitions to differentiate and relate these as specific concepts.

If elementary pupils are to be the beneficiaries of process-promoting education, the work of our laboratory must necessarily be directed at the administrators and teachers of their schools. We aim to change elementary education toward greater process orientation by helping principals, instructional specialists, teachers, and paraprofessionals to modify their behaviors in the direction of cultivating and supporting process growth in their pupils. Our general goal is to help schools make effective use of numerous process curricula which

curriculum developers and publishers are now providing. For illustrative purposes at this point we may cite three process-oriented curricula which are the products of three different development and publication programs: Man: A Course of Study; Science--A Process Approach; and Social Science Laboratory Units.

Although these process-oriented curricula, and numerous others, have been available for some time and have been field-tested in classrooms with gratifying results, a deliberate sustained effort is needed to get them into effective use in schools. In particular, installation of published curricula almost universally requires someone to design and administer a program of inservice training for principals and teachers. Further, continuing consultant service has been found to be a virtual necessity for the extended period which curriculum installation needs as it takes root in a school or district. Innovation often requires assistance from external change agents, especially when a new orientation like process promotion is involved.

It has been a primary goal of ERIE to develop strategies of curriculum installation to improve process-oriented education. In collaborating with schools for this purpose, the laboratory has deliberately sought and received help from curriculum developers and from

university personnel who are concerned with both preservice and inservice education of teachers.

In attempting to delineate the objectives which gradually evolved for our program I have strayed into some mention of our methods; this should do no harm. By hinting at methods while outlining our goals, I hope I have prepared for you a summary statement of the objectives of the plan we are presenting:

> The goals of the program conducted by ERIE are to improve process education in elementary schools by (1) assisting administrators with the selection and installation of process-oriented curricula; (2) providing (and causing to be provided) the necessary inservice preparation for teachers; (3) monitoring the curriculum installation by offering regular assessment and consultant services; and (4) using evaluative feedback to improve upon these installation and diffusion strategies.

A comprehensive plan was developed for improving process education in elementary schools. This plan--like the program goals--emerged from earlier program work with contributions being made by various staff

members at different times. Since the plan evolved gradually, it may be useful to mention some of its notable antecedents before we examine the form it took in 1969.

Program planning sessions of the Council, Board, and staff of ERIE were directed in 1966 at finding ways to assist schools to improve their curriculum offerings and instructional accomplishments. A curriculum then available which had been developed from a stated set of premises and had received field testing was Science--A Process Approach. Developed under the auspices of the National Science Foundation and of the American Association for the Advancement of Science, this innovative curriculum was being published according to a schedule which would permit its introduction into primary grades with yearly expansion into higher grade levels until a full K through 6 science curriculum was achieved. ERIE initiated a program in 1967 to install this elementary science curriculum in pilot schools of diverse characteristics--urban, suburban, and rural schools of different sizes--which were located in various parts of the laboratory's region. Choosing this process-oriented curriculum occurred before the mission of ERIE became centered in process education. As one might infer, this choice influenced the later emphasis on promoting intellectual processes

in elementary pupils. Science--A Process Approach aims at developing proficiency in a number of process categories including observing, classifying, inferring, communicating, and experimenting.

With the process-oriented science curriculum given its initial placement in cooperating schools, the ERIE staff then sought a way of promoting additional processes in elementary pupils. An art curriculum was felt to have potential for cultivating affective processes in addition to those in the cognitive domain. The designing of process-promoting art activity materials was explored. As discussion of the developmental needs of the child proceeded, it was decided that a broader approach--ranging across subject matters--would be appropriate. A program plan was drafted which bore the acronym ADEPT: Across Disciplines Education--Process Tactics. It was intended that a broad process curriculum be designed which would transcend specialized areas while exercising and refining numerous skills of cognition and feeling.

In discussion of the proposed work with a site visit team, the ERIE staff became fully aware of the immensity of the projected effort. Professional personnel, time, and resources would be needed far in excess of realistic expectation. Accordingly, an alternative approach to

improving process education was adopted. Installation strategies, under study using Science--A Process Approach, would continue to be stressed. Instead of initiating any curriculum design and development, however, ERIE was to search out and analyze for potential utility any process-oriented curricula which it found available for controlled introduction into collaborating schools.

The foregoing evolutionary summary provides a basis for our examination of the comprehensive program of ERIE as it took form during 1969. The laboratory program was unified through the related nature of its several functional components as shown in the flowchart, Figure 1. All the components are contributory to carrying out the mission of the Institute: improving process-oriented education.

A printed flowchart is--of necessity--a static representation of the dynamic activities of several staff groups. If we use the chart to get an overview of these component activities and their related nature, this should provide a foundation for the detailed component reports which are to follow. Let's examine the chart, then, moving from left to right through successive program steps.

On the left is indicated the curriculum analysis-synthesis component. It begins with a systematic search

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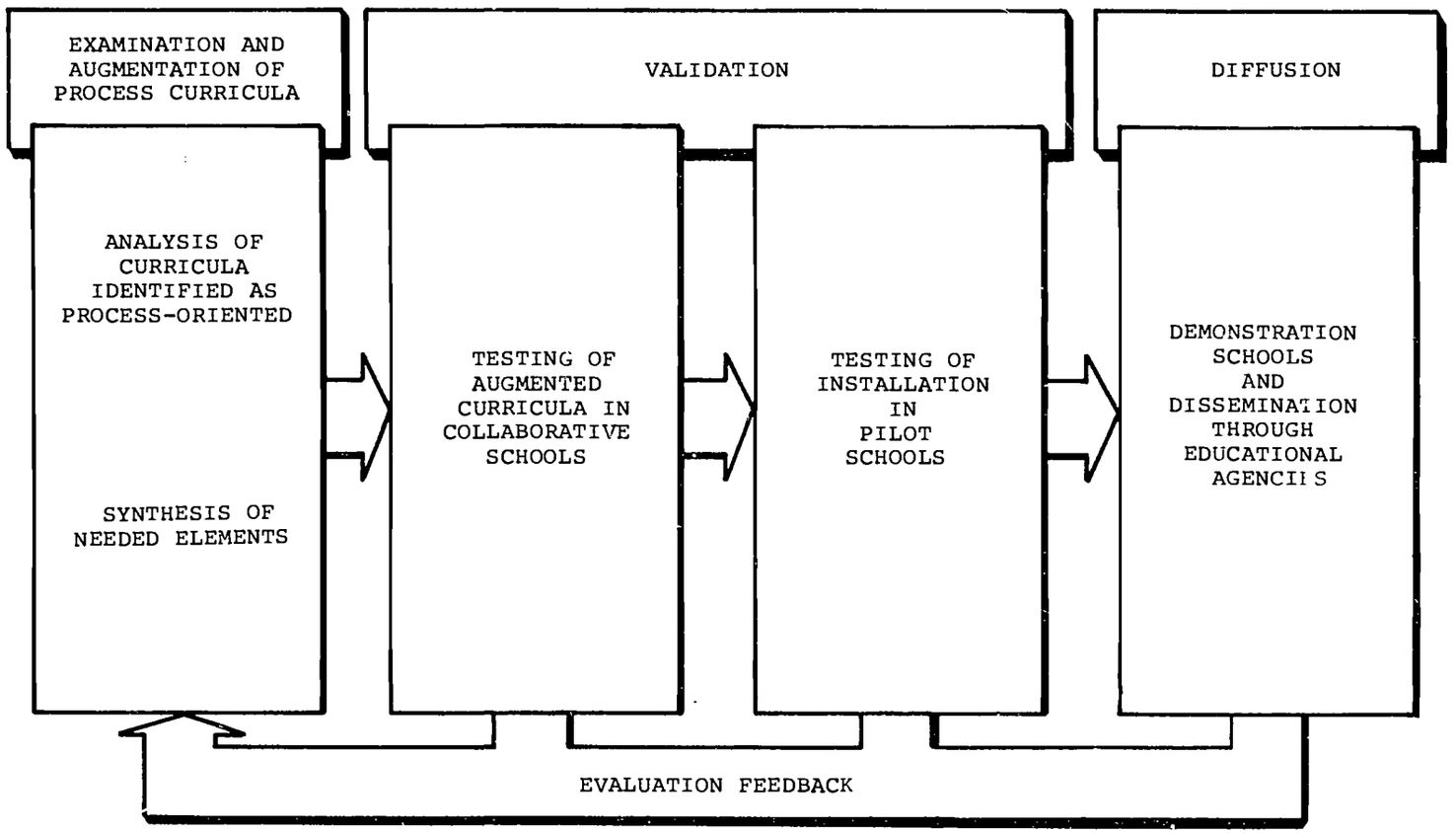
BASIC PROGRAM PLAN FOR

IMPROVING PROCESS-ORIENTED EDUCATION



for process-oriented curricula as these are readied for publication. Even earlier, curriculum materials may be found while still under development. In the paper by Henry Cole and Albert Seferian you will be given a description of the extensive and intensive search procedures which were initiated in 1968 to identify numerous curricula, teaching programs, and instructional materials which carried the promise of contributing to process education for elementary pupils.

Once located, the materials and their supporting documentation were studied to determine their process orientation and their evident utility. Each promising curriculum or unit was assessed against a set of criteria which ERIE devised for screening such material. This analysis often suggested the desirability of augmenting the published units as they were installed for process promotion. Again, the next paper will indicate how this examination was used to guide the synthesis of needed elements.

The second portion of the flowchart indicates that curricular validation is carried out in selected collaborative schools. The guiding assumption here is that only actual testing in schools can establish the real merit of a curriculum and any augmentation which may have

been provided, such as pupil-assessment instruments or inservice training of teachers. The second paper presented by Henry Cole will describe our selection of collaborative schools and the steps taken there to validate selected process curricula as teachers and pupils use them.

The intensive interaction of ERIE staff with school personnel in curriculum augmentation and validation is too demanding of time and resources to be used in every installation effort. Accordingly ERIE has sought to develop and test installation strategies to be used in networks of schools which are diverse in characteristics and geographically scattered over a wide area. This program component is represented in the laboratory's earliest (and continuing) interaction with a network of pilot schools in New York and Pennsylvania. The curricular vehicle for this study of installation has been Science--A Process Approach, selected for this effort in 1966 and first installed in 1967. Inservice workshops and continuing consultant assistance for administrators and teachers have been the chief elements in this installation strategy. Grade level expansion of the program has been provided by ERIE on a year-by-year basis. Horizontal expansion to other classrooms and to other schools in a pilot school district has often been initiated by the school or district administrators.

The regular consultant service provided to pilot schools has served other purposes besides contributing to effective curriculum installation. Visits to schools by ERIE staff have been used increasingly to permit classroom observation of teacher-pupil interaction and related collection of data to assess the adequacy of the installation. Progress reports to principals and teachers have given them the information to judge their own accomplishment and the incentive to improve their efforts. The data collection has permitted ERIE to develop some principles of curriculum installation and also to pinpoint some of the obstacles to improving process education.

The establishment of the pilot school network and the search for installation principles will be covered in the paper to be presented by James Mahan. The related report by Richard Andrulis will present the evaluation procedures used and the findings of the laboratory in this study of innovative curriculum installation.

Another of ERIE's installation strategies to be described briefly by Mahan is the establishment of a Regional Action Network of college professors of science and science education to serve as consultants to schools. These individuals were trained for their consultant roles in special conferences conducted by ERIE in the past two

years with support from the National Science Foundation. Through this geographical spread of competent individuals to work in curriculum installation the laboratory has effected a considerable economy in the provision of regular visits to the schools. In addition, professors who have been given this training have themselves--in several instances--conducted inservice workshops for teachers. Further, it is found that this involvement with a process-oriented curriculum has a salutary effect on the work of the professor with schools other than those in the program of the laboratory.

Looking again at the flowchart we see that the component indicated on the far right shows diffusion of process education through demonstration schools and ERIE-activated dissemination efforts of various educational agencies such as regional Title III centers. Again, James Mahan will be giving you some of the details on this component of the program. Let me provide you with just one bit of information. When the Board of Trustees directed an emphasis on process education to unify the mission of the laboratory, it was decided that a network of process demonstration schools would be needed. The argument was that process curricula would have to be seen in actual use before widespread swings to this mode of elementary education could be expected. Accordingly, ERIE established a new network of 32

process demonstration schools in 1969. For this first year of their process work they are using Science--A Process Approach. It is anticipated that other process curricular units will be introduced in the coming months. This will further activate the entire sweep of ERIE's work on process education from curriculum search and analysis, through augmentation and validation, to installation and diffusion.

One extremely important component of the basic program plan remains to be mentioned. As indicated all across the bottom of the flowchart there is an undergirding evaluation activity which supports every other component. It provides feedback from every stage of the work to each earlier stage. In this respect it may be seen as an exemplar of formative evaluation or decision-oriented study. The data collected at the several stages of the program plan can contribute to reformulation of the process curricula as well as to related pupil testing and teacher education. Also, these same data can provide the Board and staff of ERIE--and numerous other interested groups--with the information they need in arriving at decisions related to program planning, to curriculum reforms, and to innovative activities for schools and supporting agencies. Our broad and continuing concern with effective and useful evaluation will be treated in the paper to be presented by Richard C. Wallace, Jr. and Richard Shavelson.

Having indicated that the papers which follow in this series will greatly clarify this overview of our program plan and its operation, let me conclude briefly with some general observations. First, this program is indeed an evolving one, as my historical introduction indicated. The evolution is certain to continue. In contrast, there is a fixed purpose which provides a foundation for the entire effort. ERIE has a strong commitment to process-oriented education as serving the young learners of the elementary school. We feel that our comprehensive plan--however it may be further modified in specifics of design or action--represents a sound approach to meeting real educational needs of children through curricular cultivation of their intellectual processes. Finally, we feel that our collaboration with schoolmen of two states, with university scholars across the country, and with numerous other institutions and agencies exemplifies the concerted effort which is needed for educational betterment of any sort.

ANALYSIS OF PROCESS CURRICULA*

Henry P. Cole and Albert Seferian

ACTIVITY PRECEDING THE IDENTIFICATION AND ANALYSIS OF PROCESS CURRICULA

ERIE's Early Concern for Process Education

Since its beginning in 1966, ERIE's Board and staff have been concerned with the goals of process education. This concern was first reflected in the selection of a process-oriented, rather than a more conventional content-oriented elementary curriculum, as a vehicle to study curricular installation. This commitment to the goals of process education was further reflected in activity begun in 1967, looking toward the development of a K-6 interdisciplinary curriculum. This early ERIE program activity was referred to by the acronym ADEPT (ERIE Annual Report, 1967):

> The objective of the ADEPT program is an instuctional system, including teaching methods and materials, aimed at increasing competence in those general learning functions which underlie the several subject-matter disciplines. The program is concerned with Across Disciplines Education, and the focus is on Process Tactics by means of which children may better learn to learn [p.29].

ADEPT was an attempt to develop a curriculum that incorporated what was known about the nature of the learner and the learning process into an interdisciplinary K-6 curriculum having stated objectives dealing with cognitive,

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*The authors of this paper wish to acknowledge the contribution of Miss Susan Bernstein to the work reported.

affective, and psychomotor skills as its primary concern. The primary assumption was that curriculum and instructional practice devoted to the development of such skills would produce more effective learners and problem solvers. The justifications for this type of education have been stated and discussed by many scholars (Andreas, 1968; Bloom et al., 1956; Bruner, 1960, 1967; Cole, 1969a; Crutchfield, 1969; Gagné, 1968a, 1968b; Rogers, 1967; Rubin, 1969; Torrance, 1965; Williams, 1968; Woodruff, 1969).[1]

Alternative Approaches to Building a K-6 Process Curriculum

Two approaches were considered for the development of a K-6 process curriculum. The first involved the actual construction of the curriculum on the basis of existing educational, psychological, and curriculum theory and research. The second approach involved identifying existing curricular materials and instructional practice which were consistent with the goals of process education and were judged to have potential for articulation into a functional K-6 process curriculum.

There were advantages and disadvantages to each approach. These were noted by ERIE and were further commented upon by

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[1] For a comprehensive review of the goals, assumptions, and justifications of process education, as well as definitions for "process," "processes," and "process education," refer to "What is Process Education: An Emerging Rational Position" (Cole, 1970).

Norman Boyan during a visit to ERIE in May 1969. As Boyan pointed out, it would be more logical to construct a total process curriculum from the very beginning to avoid problems in trying to articulate non-compatible content, materials, and underlying organizational schemas. He further noted that such problems in articulation could hardly be avoided because of the fragmentary nature of curriculum theory, research, and development. He noted the great need for the educational research and development community to consolidate resources to become more powerful in effecting programmatic, long-term, massive, and logically integrated curriculum development and research. He has stated publicly some of these views more recently (Boyan, 1969, pp. 14-18). Similar views have been expressed by Stephen Bailey (1969). The chief problem with this more logical approach to building a K-6 process curriculum is that it would require much more staff, time, and money than ERIE could bring to bear on the task. ERIE's ultimate decision was to attempt the building of a process curriculum through the careful selection and articulation of existing curricular and instructional materials, components, and practices. There were several reasons for this decision:

1. During its first year of existence, the ADEPT program achieved little because its goals were too global and its staff too small. Furthermore, the 1967

ERIE Annual Report dealing with ADEPT, while intellectually stimulating, showed an almost total absence of planning for actual construction of such an interdisciplinary process curriculum. These shortcomings were noted by USOE site evaluators (Brickell et al., 1967, pp. 6-11; ERIE Site Visitation Committee Summary, 1968, pp. 12-19). Long-range plans to implement the ADEPT program by actually constructing a K-6 curriculum were begun (ERIE Contractor's Request, 1968, pp. 19-25; ERIE Basic Program Plan, 1968, pp. 18-25). These plans began to make it apparent to USOE representatives, ERIE Board members, and ERIE staff that the long-term goals of ADEPT were still not as clear as they needed to be, that it would be a major task to state clearly and to operationalize such goals, and that the actual construction of a K-6 process curriculum would require the expenditure of millions of dollars over a period of several years. It seemed unlikely that ERIE could attract the massive funds needed even if the plans were carefully developed. All of these points had been noted by Henry Brickell, chairman of the ERIE site visitation committee.

2. Historically, ERIE had already begun to examine and select, rather than construct, curricular materials for program activity. The first example was the selection of the Science--A Process Approach curriculum in 1966 as a vehicle

for the design and testing of a replicable system of curriculum installation in schools of diverse characteristics. A second and better example was the ERIE program activity concerned with the building of an individualized primary reading program from the selection and articulation of many existing commercially available materials (Mohan, 1969; Root, Mohan, and Withey, 1969). Trial use and further augmentation of the program in a laboratory school showed that it was possible to articulate a number of selected existing curricular materials into an effective process curriculum directed at major skill development in early reading.

3. A review of several significant articles on curriculum theory, development, and research showed there was little basis upon which to guide the development of such a curriculum (Shaw, 1966; Roberts, 1966; Tanner, 1966; Phillips, 1966; Parke, 1966; Abramson, 1966; Saettler, 1968). Some years ago, despite considerable effort, Bloom et al. (1956, p. 17) found that no adequate psychological theory or research existed by which to describe the range of behavior exhibited in the phenomena of learning. More recent considerations of curriculum and curriculum theory indicate that these problems still exist and probably shall for some time (Goodlad, 1969).

4. A review by ERIE staff members of the behavioral research in educational psychology, child development, perception, cognition, learning, and motivation showed that most studies have little direct and major relevance for curriculum construction. The reason for this is that the range of behavior considered in such studies is usually very narrow. This is true even for studies in the areas of concept and principle learning which are conducted in schools and which one might think had direct relevance for educational practice. There are many examples of such studies which, while interesting and perhaps important, have little relevance to the task of developing and implementing more effective curricula and instructional practice in our schools (Lubker and Spiker, 1966; Odom and Coon, 1966; Osler and Kofsky, 1965, 1966; Cole and Raven, 1969). The scope of behaviors involved in real-life learning situations with which educational practice must deal is much broader than the behaviors which have been researched. Furthermore, the relationships between the many micro behaviors researched in such studies are not at all clear. In addition, great variation exists in the methods used to conduct such studies, the content of the learning or problem tasks set for the subjects, and the definitions of terms used to describe the behavior studied. This is extremely evident if one attempts to review all studies which have been done on "classification." It soon becomes apparent that different scholars and researchers mean very

different things by the term "classification." It is also apparent that many of the most useful studies in relation to classificatory behavior may deal with behaviors associated with attribute listing, reversal and non-reversal shifts, categorization, logical multiplication, discrimination learning, rule learning, perceptual and logical constancy, and concept formation.

All of these factors led to a decision that ERIE should search for, identify, and collect a wide variety of elementary process curricula in order that they could be studied. The study of such select curricula was viewed as having a double utility. First, it would provide a better insight into the goals, assumptions, and operational meaning for process education. Second, it could possibly result in the identification of a number of curricula which could be articulated toward building a K-6 curriculum for process education.

IDENTIFICATION AND SELECTION OF EXEMPLARY PROCESS CURRICULA AND THE DELINEATION OF "PROCESS"

A Word about the Plan

A detailed procedural plan to guide program activity was developed (Cole, 1968c). It had two major objectives. The first was to delineate further the general nature, goals, assumptions, and justifications for process education in order that "process" as used in process curricula and process education might be defined. The second objective was to actually identify and select existing exemplary process curricula which could be studied and perhaps actually articulated and installed in schools. The plan outlined detailed activities and tasks toward each objective. With some modifications, the original plan has been used to direct ERIE program activity toward the two objectives over the past 18 months. Some of this program activity is outlined below.

An Initial Process List

Before the search for process curricula could begin, it was necessary to provide a statement of process categories or descriptors to guide the activity. Such a listing was needed for both internal and external use. It was necessary to communicate to both ERIE staff and to the many outside agencies and individuals contacted the nature of

the curriculum and instructional materials being sought. Consequently, an initial list of "processes" was developed (Cole, 1968b). This list, which was used for several months, may be found in Appendix A. Its construction was based largely upon the study and influence of publications by Bruner (1960, 1967); Bruner et al. (1956, 1966); Gagne (1962, 1963, 1965a, 1965b, 1968a); Flavell (1966); Guilford (1967); Parnes (1963, 1967); The Psychological Bases of Science--A Process Approach (1965); Resnick (1967); Russell (1956); Torrance (1965); Vinacke (1952); Williams (1968); and Williams and Eberle (1968). The influence of the work of many other cognitive and developmental psychologists in terms of the process categories selected is apparent from an earlier paper (Cole, 1968a).

Eight Criteria for the Selection of Process Curricula

The first eight criteria were developed primarily for identifying outstanding exemplars of process curricula in order that they and their related research, theory, teacher education materials, objectives, and other supporting documentation could be studied for purposes of gaining more insight into the parameters of the process curricula and process education. The criteria were developed in a fashion somewhat like a Gagné task-analysis. The question asked was,

"Ideally, what would be the characteristics of a curriculum most useful as an object of study to learn more about curricula and instruction for 'process' education?" These initial eight criteria appear in Table 1.[2]

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[2] The eight criteria presented in Table 1 were developed prior to October 7, 1968, by Henry P. Cole and Susan Bernstein.

TABLE 1

ERIE Criteria for the Selection of Curricular Materials and Programs for Analysis Under the Plan for ADEPT

The curricular materials and programs--

1. Must exist and be available to ERIE.
2. Have an evident psychological or educational research basis.
3. Have evolved from a large-scale or long-term systematic development effort or be in wide use.
4. Have been or are currently being exposed to a systematic, ongoing, comprehensive evaluation.
5. Are designed for use with pre-school through grade 6 children.
6. Have support documents which describe the rationale, design, basis, objectives, evaluation, and use of the program.
*7. Are designed or stated to be process-promoting or are clearly and specifically concerned with process promotion.
8. Have stated objectives for terminal behaviors.

*See "Initial List of Processes Relevant to the ADEPT Effort" (Cole, 1968b) and also page 5 of "Detailed Procedural Plan, ADEPT" (Cole, 1968c).

By process, we mean sets of intellectual skills which can, by some arbitrary procedure, be grouped into clusters of observable or inferrable behaviors. Such arbitrary clusters of observable and inferrable intellectual skills are represented by Science--A Process Approach processes (classifying, observing, measuring, etc.).

Identification and Screening of Process Curricula

The team involved in the initial search and selection of process curricula consisted of three professional staff members of ERIE and two secretarial-clerical assistants. All of these individuals had multiple assignments but did spend approximately 50 percent of their time at the search activity for a period of several months. However, the entire ERIE professional staff was one of the first sources searched for information about curricula of the type being sought. This proved to be an effective strategy since it yielded an immediate wealth of information dealing with other information sources, listings of curricular materials, and agencies which were later searched. An almost continual flow of information about new curricula or instructional materials was and still is received from our staff members. A few have continued to send such information even though they have since left ERIE to join other organizations.

The search activity itself was primarily of two types. The first, which was more passive, involved searching existing listings of instructional materials, curricula, documents, and related literature. One of the first large listings which was searched had been previously compiled by ERIE staff in a project called the Curriculum Materials

Information Project (CMIP) (ERIE Annual Report, 1967, pp. 67-75). CMIP files contained a comprehensive listing of commercially available curriculum and instructional materials. Many other listings of materials, projects, and related research were obtained from numerous agencies, clearinghouses, and individuals for examination.

The second and more active search effort involved actually contacting individuals, centers, publishers, and various agencies by letter and telephone. Sometimes, this active contact was designed to obtain further specific information concerning a curriculum, particular instructional materials, or documents identified in the earlier search activity. Requests were made for samples of materials, supporting documentation, and other literature which would help ERIE staff in screening and selecting the curricula. These contacts always also included requests for further information of other sources and listings of such materials. A partial listing of the sources searched and the agencies and individuals contacted may be found in Appendix B.

Results of the Initial Identification and Screening Activity

During the first two months of the search activity, approximately 158 agencies and centers were contacted relative to curricula of the type being sought. Replies were received

from approximately 78 of these sources. This resulted in the initial identification of more than 50 elementary curricula units or materials which seemed appropriate. Further efforts were made to collect additional materials and documents for these curricula. While this collection activity was under way, many additional potentially relevant curricula were identified. The screening of all these potentially useful curricula presented a severe logistical problem to a staff of only three persons. However, this problem was partially solved by our requests for additional information about each potentially useful set of curricular materials identified. The information requested was that specifically outlined by the eight criteria. The first screening procedure consisted of listing the potential curricula identified and the eight criteria in a matrix. The profiles of the curricula identified were indicated by check marks and comments made on each of the eight dimensions. Those curricula for which little or no information could be obtained on most of the eight dimensions were automatically screened out. Most curricula identified in the search activity were excluded in this manner.

During the initial screening of curricula, it was discovered that many curricula listed in various information sources were nonexistent or not capable of being replicated

for export to another site. Many were programs or strategies which had been implemented but could not be duplicated because they depended upon a particular unique set of materials, persons, or local environment. Many programs of this latter type, while once in operation, had completely disbanded or were operating at an austerity level, and few or no materials and documents could be obtained for study.

Some interesting and potentially useful process curricula were identified which did meet many of the criteria. The percentage, however, was small. At the end of four months of search activity, over 350 distinct curricular components, units, and materials had been identified. Yet, it was possible to obtain the additional information demanded by the eight criteria for only about 35 of these, and only about 20 were judged appropriate to ERIE's needs after their materials and documents were reviewed (Cole, Bernstein, Seferian, et al., 1969). However, it became apparent that these 20 included a few promising curricula. Generally, these curricula represented attempts to apply existing theory and research to educational practice. They were definitely designed for the deliberate promotion of highly useful and generalizable behaviors. They also had a large number of associated supporting documents dealing with underlying theory, objectives, teacher education, program evaluation, and research on effectiveness. They were promising in the sense that they

were far more adequate on the eight criteria than is typically the case. These curricula and their many related documents seemed extremely worthy of study as a means of gaining further insight into process education.

The initial work also made it clear that additional and more detailed criteria would be needed if the curricula identified were to be selected for actual articulation and installation in schools. Although a given program might be very useful for purposes of detailed study to learn more about the characteristics of process curricula, it might not be appropriate for installation in schools. It was also realized that each of the curricula tentatively selected in the initial period would need to be subjected to a much more detailed study. Additional supporting documentation and all curricular materials would need to be gathered and studied. It was also foreseen that such activity would be very time-consuming, thus excluding the detailed study of more than a few curricula selected as most promising.

Study of Selected Process Curricula Against Detailed Criteria

The development of the detailed criteria began two months after the initial search activity for process curricula. Additional practical criteria were first developed. These considered the cost, availability, relevance, management, amount of teacher and administrator training and monitoring

assistance required for installation, degree of compatibility with the usual curricular content, and the length and scope of the programs considered. The initial eight criteria were also expanded and made more detailed and explicit.

First attempts at rating curricula indicated that the new detailed criterion form was not functional. Each criterion item was to be rated on a scale from 1 to 5. However, the five rating points did not have specific and arbitrarily agreed upon denotation nor had differing weights been assigned to the various criteria. Therefore, the ratings as such were not useful in any statistical sense and were not helpful as descriptors. The ratings reflected a subjective judgment. In order to make this judgment comprehensible, the ratings had to be justified and supported by rather complete, succinct, written observations drawn from detailed study of the curricula and their related materials. The criterion categories themselves were further refined and made more explicit so that, hopefully, any ERIE staff member could work effectively with the detailed criterion form. After several revisions of this sort, a detailed criterion form was developed and found to be useful. This may be found in Appendix C.

The amount and depth of information required by the detailed criteria required the reviewers to become very familiar with the curriculum under study. It was necessary

to study all available supporting documentation and to review the pupil and teacher materials. It was also necessary to enter into direct interaction with the curriculum developers, as well as teachers and schools actually using the curricula.

Over a period of a few months, detailed criterion sheets were prepared for only ten curricula which had been identified. Seven of these curricula were very extensively studied. These included the Materials and Activities for Teachers and Children, Man: A Course of Study, SRA Social Science Laboratory Units, Science--A Process Approach, the Productive Thinking Program, the Minnesota Mathematics and Science Teaching Project, and the ERIE Basic Skills Readiness Program. The size and complexity of the task required that five more ERIE professional staff become involved in the analysis of the eight curricula against the detailed criteria.

There were problems in trying to establish interjudge reliability. The curricula being rated were too multi-faceted and complex, and there were too few judges to make such a procedure meaningful. An alternative plan was to prepare independent ratings by ERIE staff and to later review, compare, and combine these preparatory to examining them with the developers for the curriculum under study. This procedure was followed in most cases.

In all cases, the preparation for this formal review of these curricula involved prior detailed conferences between key individuals of the programs under study and ERIE staff. In most cases, several follow-up meetings occurred. These have resulted in numerous internal reports which contain much information other than that required by the detailed criteria. The information obtained from such meetings, along with the information from the detailed criteria, was translated into descriptive summative reports for five of the curricula studied. The summative reports were found to be generally more useful than the detailed criteria in explaining the nature, purpose, and characteristics of each curriculum studied.

During this activity, it became apparent that many of the questions raised by the detailed analysis could not be answered until the curricula in question could be installed, observed, and studied in actual school settings. Since that time, five of these curricula have been installed in laboratory schools, and much additional information has been obtained.

A Reminder

The purpose of all this activity was to enable ERIE to learn more about the characteristics of existing exemplary process curricula and to identify such

curricula which could be actually installed in elementary schools toward the articulation of a K-6 process curriculum. All the detailed criterion sheets, detailed summative reports, and the numerous other materials prepared in relation to the study of these curricula were primarily for internal use. With the exception of one report, none of these documents have ever been publicly or widely distributed. In undertaking this activity, ERIE was not attempting to set itself up as an agency concerned with endorsing certain educational products. Rather, we have been concerned with the identification and study of a particular type of curricular materials and educational practice.

The Delineation of "Process"

The development of an initial list of process categories has previously been discussed. Following this activity, much effort was made to develop a schema capable of incorporating and organizing the behaviors listed in the various process categories encountered in the curricula and documents under study. This proved to be an extremely difficult task. Specific attempts were made to develop a general organizational schema for the process categories of Science--A Process Approach (Science--A Process Approach Commentary, 1968), Williams (1968), Resnick (1967), the ERIE Basic Skills Readiness Program (Root, Mohan, and Withey, 1969), and the Minnesota Mathematics and Science Teaching Project (Adams, 1968). The process categories, related objectives, and the actual tasks set for

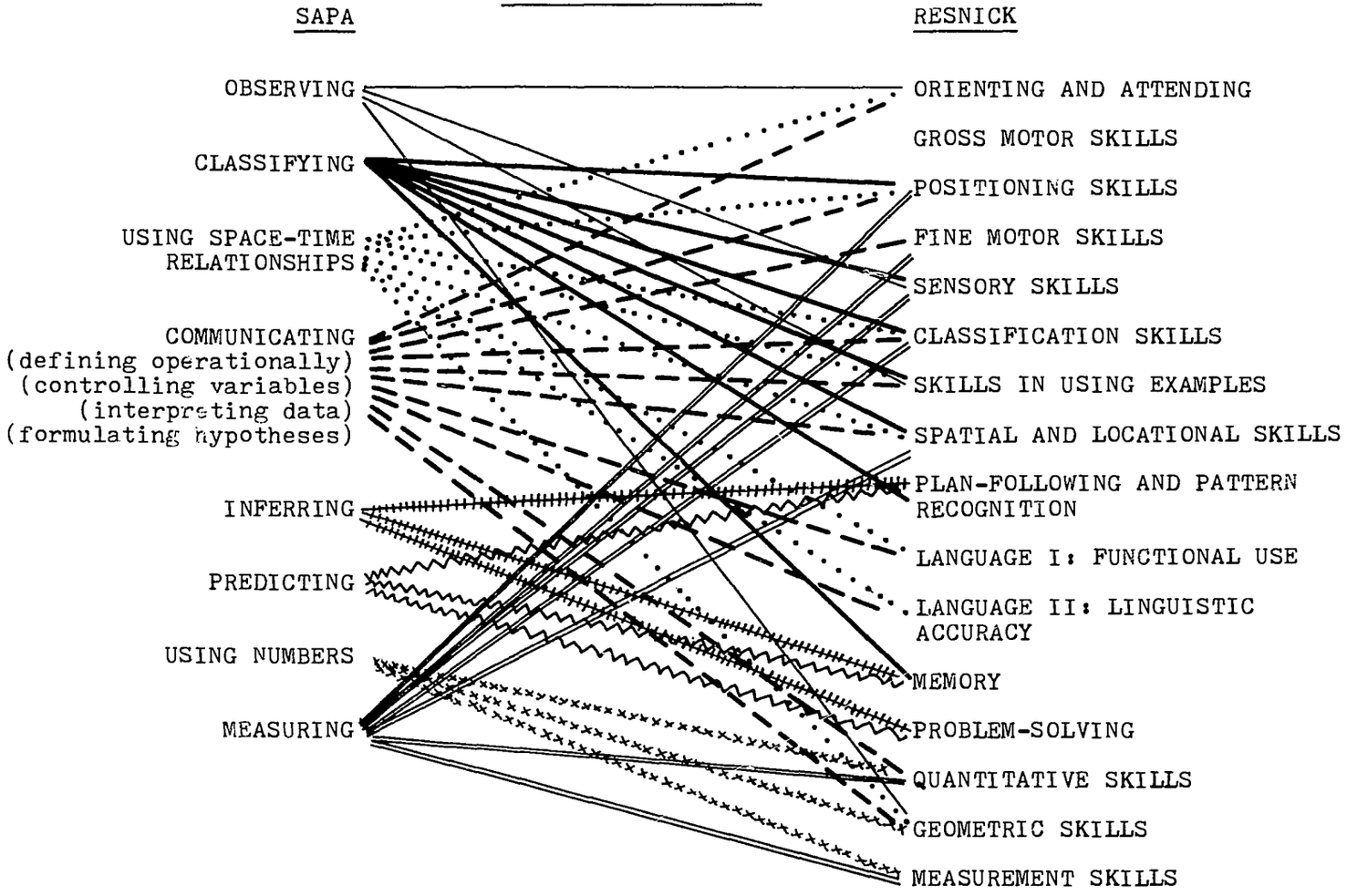
pupils in these curricula were studied. Attempts were made to cluster the several process categories and their behaviors. One of these attempts for the Science--A Process Approach and the Resnick process categories is shown in Table 2. The interrelationships between the two schemata are extremely complex. This was true for each process schema considered. The problem is that the same pupil behaviors are sequenced and categorized very differently in the various process categories of different curricula and curriculum developers. Furthermore, the process categories for a given schema tend to be highly redundant. Many of the same behaviors tend to appear again and again under different process categories. The Science--A Process Approach curriculum process categories provide a good example of this redundancy (Cole, 1968a).

Over a period of several months, regular biweekly meetings occurred among 7 to 10 ERIE staff members to discuss the behavioral organization of the curricula under study and their related process categories. Three members of this team were quite highly familiar with all of the curricula and schemata under consideration. The remaining members of the team tended to be specialists having extensive knowledge of a particular curriculum and its related process categories. The sessions were frequently heated and frustrating, as well as being interesting and informative. It was soon learned that "one man's inference is another man's classification". This was true to some extent for the staff involved in the

TABLE 2

Behavioral Relationships Between Two Process Schemata*

PROCESS CATEGORIES



*This chart of relationships was prepared by Susan Bernstein and Henry Cole following study of documents and materials from Science--A Process Approach (AAAS, 1968), and Design of an Early Learning Curriculum (Resnick, 1967).

meetings and to a much greater extent for the developers of the curricula and process categories under study.

The results of this series of meetings were several very similar sets of general categories which looked very much like the problem solving sequence behaviors of Polya, Dewey, Bloom, Vinacke and others listed by Russell (1956, p. 256). The generality of the categories which emerged can be explained by the differences in the content, behavioral organization, and underlying theory of the various curricula under consideration. Nothing but a broad set of categories would adequately embrace all of their differences. There is a second point which should not be overlooked. All of the curricula under study have essentially the same type of high-level terminal objectives concerned with helping the child to become a better problem-solver and analytic thinker. This is their strong common thread. Thus, the schema to best represent all of them may be a general problem-solving sequence of the type discussed by Russell (1956). However, it is doubtful that such general problem solving sequences have any direct utility to guide teacher education, curriculum construction, and educational practice. Such broad categories need to be operationalized in terms of stated behavioral expectancies for pupils and teachers which have potential for general transfer in many settings.

In an attempt to better define process and process education, many additional documents as well as those associated with particular curricula were studied. In

addition, many interactions and conferences occurred with key scholars (Andreas and Cole, 1968a, 1968b, 1968c, 1968d, 1968e, 1968f). Many other reports were prepared by ERIE staff following conferences with many other scholars where process, process education, and related matters were discussed. Robert Gagné's insights, both as presented in conferences with ERIE staff and in his numerous writings, were particularly helpful and have been instrumental in the further delineation of the goals, assumptions, definition, and operationalization of process education. The results of this activity to delineate and define process education are presented in other papers (Cole, 1969a, 1969b, 1970). Documents and techniques dealing with the further operationalization of the goals and assumptions of process education are currently under development. Their further delineation and revision are viewed as a means to guide teacher education and evaluation activities for the implementation of educational practice toward the goals of process education.

RESULTS AND CONCLUSIONS

Results of the Search, Selection, and Study of Process Curricula

A number of curricula believed to have potential for articulation into a K-6 process curriculum were identified (Cole, Bernstein, Seferian, et.al., 1969; Seferian, Cole, Bernstein, 1970). However, most curricula identified were woefully incomplete. Many did not exist in the real sense that they could be exported to other localities. Many other curricula consisted exclusively of materials with few or no instructions for their utilization. Still, other so-called curricula consisted only of teacher education strategies and "ideas" for instruction. Some curricula which could be considered quite complete and had been carefully developed were, in reality, only a few hours or days long. They were, in effect, a short series of lessons or teacher guides and not a major curriculum component. These and earlier findings led to the hypothesis that to be sufficiently ready for wide-scale installation and dissemination, a curriculum needed five characteristics:

A clear statement of objectives.

A variety of refined instructional materials, methods, and organizational arrangements.

Reliable and valid measures of pupil proficiency.

An effective teacher education program.

Evaluative data on the effective utilization of the curriculum in schools.

These five dimensions became a new set of criteria which were used to determine the readiness of the curricula identified for installation into laboratory schools. It soon became apparent that even the most promising process curricula identified did not fully meet these five criteria for installation. However, a few of the curricula which had been identified and screened on the detailed criteria also met two or three of these additional criteria for installation quite well. Several of these curricula were recommended for installation and study in ERIE laboratory and network schools.[3] It was hoped that such installation would provide the opportunity for further detailed analysis and study of the curricula in actual operation. It was believed this would result in further information relative to the readiness of these curricula for both large-scale installation and dissemination and their potential for articulation into a K-6 process curriculum.

It was learned that it would be difficult to formulate a well-articulated K-6 curriculum on the basis of the process curricula identified. There were at least three reasons for this.

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3 These included Man: A Course of Study (MACOS), selected units from Materials and Activities for Teachers and Children (MATCH), SRA Social Science Laboratory Units (SRA/SSLU), Minnesota Mathematics and Science Teaching Project (MINNEMAST), and Science--A Process Approach. Several other elementary curricula including the Science Curriculum Improvement Study program (SCIS) were also recommended for possible installation in laboratory schools. Although their analysis against the ERIE detailed criteria had not been completed, sufficient information had been gathered to indicate they were appropriate for inclusion.

First, selection of the most promising curricula for installation in schools produced an incomplete patchwork of programs on a grade by subject matrix (see Table 3). Second, in some cases process curricula identified could not be simultaneously installed and articulated in the same school because they were too similar with respect to content. Science--A Process Approach and the Science Curriculum Improvement Study are good examples of this. Both were judged appropriate. However, one could hardly expect to install two massive elementary science curricula in the same school, especially if the intention was also to install the Minnesota Mathematics and Science Teaching Curriculum. Third, most of the curricula identified as promising were too small in scope and sequence to replace ongoing curricular practice. Virtually every grade level from K-6 could be assigned process curricula of this type but only at great risk of confusion because of the extremely diverse nature of the content and organization encountered. Many of these smaller curricular components are of excellent quality. However, it was soon recognized that the construction of a logically articulated, several-year curricula sequence from such multiple components would be both extremely difficult to manage and prohibitively expensive.

TABLE 3

Process Curricula Recommended and Subsequently Chosen by ERIE for Installation in Laboratory Schools

Subject	Grade Level						
	K	1	2	3	4	5	6
Science	SAPA* Part A	SAPA Part B	SAPA Part C	SAPA Part D ** MATCH	SAPA Part D MATCH	MATCH	
Reading	ERIE Reading Level A	ERIE Reading Level B	ERIE Reading Level C				
Math	MINNEMAST	MINNEMAST	MINNEMAST				
Social Studies		MATCH	MATCH	MATCH	MATCH	Man: A Course of Study MATCH	SRA Social Science Lab Units MATCH

* See footnote on bottom of page 40 for meaning of acronyms presented in this table.

** MATCH Units, because of their short duration and flexibility, were recommended for multiple use across content areas and grade levels.

Results of the Attempt to Delineate and Define "Process" Education

Great diversity in the underlying theory and in the behavioral organization of the process categories of the curricula identified and studied make it very difficult, if not impossible, to apply a particular model or schema to all process curricula. The same behaviors are classified in different process categories in different curricula. As was mentioned before, the rule seems to be, "One man's inference is another man's classification." While the process categories of different curricula have common behaviors, they also deal with behaviors peculiar to their own situation. Furthermore, all the process categories of all curricula studied appear to be behaviorally non-orthogonal.

Despite great differences in underlying theory and in behavioral organization, there are two points of communality for most process curricula. First, while particular process curricula may be concerned with a few global objectives not common to other curricula, there are a set of global outcomes central to all curricula studied. These are reflected in the high-level overall objectives or terminal outcomes stated for these curricula with respect to pupil behavior. Second, the particular tasks the child is asked to engage in are similar in many instances across the curricula despite differences in underlying theory and behavioral organization. A study of the objectives of

such curricula and an examination of the tasks actually set for the child and the teacher has led to the observation that there are several categories of behaviors of central concern to these process curricula (Berra, Calvert, Cole, et al., 1969; Cole, 1969c, 1969d). Documents further delineating these common behavioral expectancy categories are now in preparation.

Logical models and theoretical positions as the basis for behavioral organization for process curricula and instruction are probably of little value in the practical problems associated with the identification, articulation, installation, and related teacher education and evaluation activities of diverse existing process curricula. It was concluded that a more viable approach would be to specify those generalized behaviors that both the teacher and pupil are expected to exhibit across the select group of curricula studied. It is possible to empirically validate such stated expectancies through objective field studies. Such studies are needed to identify the variables significantly related to the promotion of the stated terminal pupil behaviors which are represented in the expectancies ERIE has derived. As Goodlad (1969, p. 368) says, it is only after such objective field studies have occurred that testable hypotheses can be produced relative to curriculum construction and utilization. The specification of such generalized behavioral expectancies has great implication for teacher education, evaluation of

curriculum effectiveness, and further curriculum research and development.[4]

SUMMARY

The purpose of the activity outlined in this paper was twofold. First, it was necessary to learn the extent to which existing curricula materials could be used for articulation into a K-6 process-promoting curriculum. Second, it was necessary to learn a great deal more about the objectives and characteristics of process education. It was decided that perhaps the best way to gain such insight was to select for detailed study those few outstanding elementary school process curricula which really did exist, had an evident basis in theory and research, had evolved in a careful and systematic manner, had actually been used and studied in elementary schools, had been designed to promote the development of intellectual skills or processes, and for which documents dealing with these and related topics could be obtained. A plan was developed which resulted in the identification and selection of such outstanding curricula. Most of the curricula selected for study were developed by scholars, theorists, and researchers who have done extensive work in the social and behavioral sciences. Frequently, the results

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[4]Papers dealing with these and related matters are currently in preparation by ERIE staff.

of their work in these fields has been incorporated into the curricula they have developed. The study of these curricula has produced two major results.

First, it confirmed the earlier hypothesis that a complete curriculum ready for installation needs five components: 1) stated objectives, 2) a variety of tested instructional materials, 3) measures of pupil proficiency, 4) a tested teacher education program, and 5) evaluative techniques and data dealing with curriculum effectiveness. Second, it has been learned that, while diverse in their underlying theory and organization, these curricula are concerned with common generalizable pupil and teacher behaviors. The utility of these behavioral categories for educational practice may be empirically tested. In defining the parameters of process education, such empirically-derived generalizable behavioral expectancies may prove more useful than theoretical models. This seems especially likely given the present inadequacies of curriculum and learning theory and the present unsystematized development of many diverse elementary curricula.

APPENDIX A

INITIAL LIST OF PROCESSES RELEVANT TO THE ADEPT EFFORT

Henry P. Cole

August 1968

Foreword

This list of process categories was developed primarily for internal use at ERIE. It was needed to help clarify the type of curricular materials and related literature which an ERIE team of three members was attempting to identify and to select for further study and possible articulation into an elementary school process curriculum. Later, during the last three months of 1968 and the first three months of 1969, the process list was used externally as ERIE staff interacted with a few hundred scholars, curriculum developers, and agencies around the country in the search for process curricula. The list was used to describe the type of curricula and instructional materials ERIE was seeking.

It should be noted that the process list is highly redundant. Many of the five categories deal with the same behaviors. However, during the preparation of the list, it was felt that a similar redundancy existed in much of the curricular and instructional materials development and related research available. Therefore, the list, while redundant in content, was designed to be broad enough and organized in such a way as to elicit responses from many different agencies and individuals who could perceive that their efforts at curriculum development were related to our interests.

Henry P. Cole
January 1970

INITIAL LIST OF PROCESSES RELEVANT TO THE ADEPT EFFORT[1]

1. Attending and Orienting

This process category is concerned with orienting and attending to visual, auditory, tactile, and other stimuli. Listening, direction following, and critical observation skills are all part of this process.

2. Flexibility and Divergence

This process category involves flexibility in both the reception or interpretation of stimuli (input) and in the encoding of behavior subsequent to stimulation (output). It is desirable to be flexible in interpreting a given stimulus field in a variety of ways. It is also desirable to be flexible in responding to a given stimulus situation in a variety of ways. These points are established by a wealth of psychological research in the areas of personality, perception, cognition, problem solving, and creative behavior. It is important to note that such flexibility is desirable in all aspects of one's functioning. That is, the ability to organize and reorganize stimuli applies to stimuli which are predominantly logical or cognitive symbols as well as to sensory and affective stimuli. The subsequent cognitive,

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[1] See the Basic Program Plan for the Eastern Regional Institute for Education, September 16, 1968, pp. 18-25.

affective, and motor responses which result from cognitive and affective stimuli should also have a great capability for flexibility. Guilford has termed this ability as "divergent production." We are interested in existing curricular materials and research concerned with:

a. Divergent Interpretation--This refers to the ability to make multiple and varied interpretations of sensory, cognitive, and affective input.

b. Divergent Production--This refers to the ability to make multiple and varied motor, cognitive, and affective responses (output) to stimuli encountered.

c. Fluency and Elaboration--This refers to the ability to exhibit fluency and elaboration in the interpretation of sensory, cognitive, and affective stimuli, as well as in the motor, cognitive, and affective responses to such stimuli.

d. Decentration--This refers to the ability to attend to a wide variety of the stimuli arising from a stimulus field and to be able to break sets in order to reinterpret and to reorganize perception, feelings, ideas, and behaviors. Again, it applies to both the organization of sensory, cognitive, and affective inputs and the organization of the resulting responses (outputs).

e. Inquiry Development--This refers to the use of the inquiry and discovery approach to promote creative behavior, problem solving, learning, and divergent thinking.

3. Classification

This is the name we are using for a process category concerned with perceptual and cognitive discrimination, attribute identification, serial ordering, single and multiple stage classification, logical multiplication, iteration, and measurement. We are interested in locating existing materials or related research which deals with the training of these skills from as many sensory modes as possbile. Many of the existing materials designed to teach classification skills are visual. Yet, it would seem that serial ordering and other types of classification skills could be taught utilizing auditory and tactile modes, as well as the visual mode. We are also interested in materials and research concerned with classification on a sensory, logical, and affective level.

4. Translation and Transformation

This process is always involved in any situation where a human must act on the basis of information gained from his environment. We view this as having two parts. First, aspects of the environment must be interpreted or decoded. Second, the subsequent behavior of the individual must be encoded. Again, we are interested in curricular materials and related studies which are concerned with the decoding of stimuli by many sensory modes, not exclusively by the visual mode.

We are interested in identifying materials, methods and techniques designed to teach young children to decode or interpret figural patterns, symbolic patterns, graphs, maps, and thematic materials. Although figures, symbols, graphs, and maps might generally be visual, they could also be tactile or auditory.

We also wish to identify curricular materials and research concerned with the encoding of behavior such that the individual produces from his experience, figures, symbols, maps, graphs, and thematic descriptions. That is, upon the basis of his experience with a given situation, we would like the child to be able to describe it by the production of figures, symbols (verbal, wordal, or other), graphs, charts, maps, diagrams, stories, motions, facial expressions, or other acts.

5. Problem-Solving

This process category is loosely defined. It is undoubtedly built upon all those process categories listed above. It may, as a first approximation, be broken into:

Exploratory behavior--Inquiry
Problem sensing or recognition
Problem finding

Problem formulation

- Psychomotor modes
- Language modes
- Symbolic modes
- Graphic modes

Hypothesis formation (Inductive reasoning)

Hypothesis testing (Deductive reasoning)

Problem solution (Deductive application of tested procedure)

It is understood that the problem-solving steps listed here do not generally proceed in a linear fashion. The steps listed are also extremely arbitrary.

APPENDIX B

PARTIAL LISTING OF SOURCES CONTACTED IN SEARCH FOR CURRICULA FOR PROCESS EDUCATION

The names of agencies and individuals listed under these categories are presented as samples of sources contacted.

Journal and Reference Sources

Education Index

Psychological Abstracts

Review of Educational Research

Meetings and Exhibits

American Educational Research Association

American Psychological Association

Association for Supervision and Curriculum Development

Eastern Psychological Association

National Council of Social Studies

National Science Teachers Association

Educational Information Centers

All ERIC Clearinghouses

University of Colorado Educational Research & Service Bureau

Office of Education Educational Materials Center

School Research Information Service (SRIS)

Educational Products Information Exchange (EPIE)

Harvard Clearinghouse on Educational Differences

Title IV Regional Education Laboratories

Center for Urban Education

Education Development Center

Far West Laboratory for Educational Research and Development

Northwest Regional Educational Laboratory

Research for Better Schools, Inc.

Title IV Research and Development Centers

Center for the Study of the Evaluation of Instructional Programs (UCLA)

Learning R&D Center (University of Pittsburgh)

R&D Center in Educational Stimulation (University of Georgia)

Stanford Center for R&D in Teaching

Wisconsin R&D Center for Cognitive Learning

University Centers and Projects

Florida State University Science Education Center

Lincoln Filene Center of Tufts University

Ontario Institute for Studies in Education

University of Maryland Science Teaching Center

University of Minnesota Mathematics and Science Teaching Project

Title III Centers and Projects

ECCO (Educational & Cultural Center for Onondaga and Oswego Counties)

Environmental Science Center

Genesee Valley Science Teaching Center

Project ME (Movement Education)

State and Local Agencies and Projects

Boards of Cooperative Educational Services of New York

Contra Costa (California) Social Studies Program

Project Beacon

World of Inquiry School (Rochester, N.Y.)

Publishers and Producers

Addison-Wesley

American Science & Engineering

Churchill Films

EdCom Systems, Inc.

Films Incorporated

Harcourt, Brace, & World

McGraw-Hill

Science Research Associates

Scott-Foresman

Xerox Corporation

Business and Industry

Columbia Broadcasting Co.

Eastman Kodak Co.

General Learning Corp.

International Business Machines

Responsive Environments Corp.

Westinghouse Corp.

Other Projects and Programs

Boston Children's Museum

Creative Education Foundation

Creative Problem-Solving Institute

National Schools Project

Perry Preschool Project

Key Persons in Curriculum R&D, Psychology, and Education

Randolph Brown
Jack Churchill
Martin Covington
Robert Davis
Peter B. Dow
Elliot Eisner
David Elkind
Robert Fox
Jack Fraenkel
Robert M. Gagné
Chris Hale
James Hills
Robert Karplus
David R. Krathwohl
Frederick Kresse
Ronald Lippitt
Robert Mager
G. Stanley Marshall
Charles C. Matthews
John Michaelis
Sidney Parnes
Lauren Resnick
Richard Ripple
Richard Snow
Calvin Taylor
Herbert Thier
Paul Torrance
Frank Williams
Margaret Woods
Herbert Zimiles

Plus the entire professional staff of the Eastern Regional Institute for Education

APPENDIX C

Criteria for Selection of Curricular Materials

The following criteria have been suggested by PAC for use in the screening and selection of curricular materials for 1969 ERIE installation in pilot schools. Curricular materials reviewed will be judged on each of these criteria and rated from a "1 to 5" with "5" being the highest rating. A question mark should be used to indicate that the rater has insufficient information to make a judgement concerning a particular criterion. If a particular criterion statement does not apply the letters, N. A. should be placed in the blank. Following each criterion statement there is a space for appropriate comments.

The first twelve criteria represent more profound, long-term considerations. The remaining criteria deal with more immediate and pragmatic considerations.

Program or Curricular Unit Reviewed: _____

_____.

Reviewed by: _____.

Date: _____.

Comments:

Criteria for Selection of Curricula Materials:	RATING
1. State grade or age level for which designed	_____
2. Explicitness of basis in psychological or educational research	_____
3. Adequacy of development	
a. large scale (number of developers, size of project effort)	_____
b. long term	_____
c. wide trial or use	_____
d. systematic in planning, ongoing evaluation and refinement	_____
4. Adequacy of evaluative efforts	
a. research design	_____
b. pupil behavior	_____
c. teacher behavior	_____
d. materials and program	_____
5. Outcome of evaluation	
a. by program developers	_____

b. by independent investigators _____

6. Quality of documentary support for

a. rationale or philosophical basis _____

b. choice of objectives _____

c. design of materials and instructional procedures _____

d. formative evaluation efforts (of instructional materials and procedures) _____

7. Adequacy of teacher education materials and methods assessed by independent judges _____

8. Degree of concern with process promotion

a. claimed by the developers _____

b. assessed by independent judges _____

List stated processes

List implied processes

9. Utility of processes for further learning _____

10. Economy of time spent using the program due to its emphasis of major process objectives common to several disciplines _____

11. Student acceptance _____

12. Behavioral specificity of short term objectives _____

Additional Practical Criteria for Selection of Materials for 1969 Installation in Pilot Schools

13. Availability for installation

a. in sufficient quantity yes no

b. in degree of readiness _____

14. Ease of installation

a. state duration _____

b. state grade level span _____

c. minimal augmentation of materials is required

1. claimed by developers _____

2. assessed by independent judges _____

d. minimal teacher training is required

1. claimed by developers _____

2. assessed by independent judges _____

e. minimal monitoring assistance is required

1. claimed by developers _____

2. assessed by independent judges _____

15. Ease of ERIE staff training _____

16. Salience when in classroom use _____

Programs need to be rated on the following criteria in relation to specific schools being considered for pilot or laboratory schools.

17. Acceptability to school district administration

a. cost _____

b. relevance, advance (degree to which program builds upon past experiences and programs of the school) _____

c. degree to which program is non-competitive with other programs _____

d. need felt _____

e. readiness to innovate _____

18. Administrator, Supervisor, and Teacher Acceptance

a. degree to which program builds upon past administrator and teacher experience _____

b. readiness to innovate _____

c. need felt _____

d. non-competative with other programs _____

e. degree to which teaching and management techniques are familar _____

19. General community and parental acceptance _____

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CURRICULUM AUGMENTATION AND VALIDATION*

Henry P. Cole

ACTIVITY PRECEDING CURRICULAR AUGMENTATION AND VALIDATION

The detailed study of process curricula reported in the previous paper led to the conclusion that it would be possible to begin the articulation of an actual K-6 process curriculum. However, even the most promising curricula did not meet the five criteria for a sufficiently complete curriculum. It had been hypothesized that, before curricula can be considered ready for installation, they need: 1) specified objectives; 2) a variety of instructional materials; 3) measures of pupil proficiency; 4) a teacher education program; and 5) evaluative techniques and data dealing with curriculum effectiveness. Analysis of selected elementary curricula against ERIE detailed criteria had also led to the conclusion that the curricula must actually be installed and studied in a laboratory school setting. This was viewed as necessary both for the articulation of multiple curricular components toward a total K-6 process curriculum and for more effectively determining the type of augmentation needed on the five dimensions stated above.

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Augmentation and Validation Defined

Augmentation of curricula was defined as that activity related to the further development of existing curricula components along the dimensions represented by the five ERIE criteria for a complete curriculum component. Therefore, a particular curricula component could be augmented relative to objectives, instructional materials, pupil tests, teacher education, and evaluative techniques and data dealing with its general effectiveness.

Validation was defined as that activity concerned with answering the questions, "Is the curriculum installable, manageable, and teachable?" and "Does it generally promote the specified and desired teacher and pupil behaviors?" Validation was to provide information about the general effectiveness and readiness of the curriculum for installation and dissemination according to its profile on the five ERIE criteria. The validation activity was to be ongoing at all stages, occurring before, during, and following augmentation; thereby providing information on the general effectiveness of the curriculum at any stage of augmentation (Criterion 5) and providing feedback on the degree and type of further augmentation needed (Criteria 1, 2, 3, and 4).

In summary, validation was defined as activity concerned with the continual assessment of curricular components relative to the five criteria, while augmentation was defined as effort concerned with the further development and strengthening of the curricula along the five dimensions to make them progressively more valid with respect to the five criteria.

A Plan for Augmentation and Validation

A detailed plan for the augmentation and validation of selected process curricula components was developed (Bickel & Cole, 1969). It was based upon several assumptions, with the first being that curricula augmentation and validation require the installation and intensive study of the curricula in actual school and classroom settings. It was also assumed that curricula which did not have stated objectives, teacher education programs, or some other desired characteristic could be further developed by ERIE staff in collaboration with the original curriculum developers, commercial producers, and practicing teachers in the schools.

The basic parameters of the plan were derived from information collected from the large-scale search and screening of several hundred elementary curricula and the subsequent detailed study of several of the most exemplary (Cole & Seferian, 1970). While none of the curricula identified and

studied adequately met all five criteria, those selected were judged to be superior to any other existing elementary curricula on at least two of the criteria. Therefore, particular existing exemplary curricula defined the ideal to be approached on one or more of the five dimensions.

The procedure for augmentation and validation was called "The Generalized Synthesis Plan" since it was intended that existing curricular components, additional objectives, tests, teacher education materials and programs, and evaluative techniques be brought together toward the building and validation of more effective curricular components. It was further intended to bring these more completed components together in one or more actual schools over a period of from five to seven years toward the eventual articulation of a total K-6 process curriculum.

The plan outlined detailed steps, procedures, and activities for curricular augmentation. It was structured so that, depending upon the status of a given curriculum component against the five ERIE criteria, certain phases in the augmentation procedure could be skipped in whole or in part. This allowed the plan to accommodate the several curricula components selected, none of which were judged to need the same type of augmentation. Thus, each curricular

component selected for augmentation had its own individual route of specified activities and tasks within the generalized plan. As it was implemented, the plan was extensively developed into operational tasks and assignments.

The organization and sequencing of the activities and tasks in the plan were greatly influenced by a study of the educational product development cycle created by the Southwest Regional Laboratory (Popham, 1966, 1967a, 1967b, 1967c, 1967d, 1967e; Popham & Baker, 1967; Baker, 1967a, 1967b). The ideas of Robert Gagné and Robert Mager as revealed in conferences and writings also influenced the design of the synthesis plan (Mager, 1962, 1967, 1968a, 1968b; Gagné, 1963a, 1963b, 1965a 1965b, 1967, 1968a, 1968b; Andreas & Cole, 1968b, 1968c).

A School for Installation of Multiple Process Curricula

ERIE had previously installed the Science--A Process Approach curriculum in many schools (ERIE Annual Report, 1967, pp. 57-66). Reading and mathematics curricula had also been previously installed by ERIE in one Syracuse city school (ERIE Annual Report, 1967, pp. 44-55; ERIE Basic Program Plan, 1968, pp. 38-43). However, it was felt that another nearby school should be obtained where the simultaneous installation of the several process curricula in different grade levels and subject matter areas could initiate

the building of a total K-6 process curriculum. The site desired for this activity came to be known as a "collaborative school." This term reflected the idea that the pupils, teachers, support staff, and administrators of the school site were to collaborate with ERIE in several ways: 1) actual installation of the several selected curricula; 2) providing feedback information and data about these curricula; 3) identification of the augmentation needs for particular curricula against the ERIE criteria; 4) trial utilization of subsequently modified and augmented curricula; and 5) validation of the effectiveness of selected curricula in promoting particular teacher and pupil behaviors. It was felt that the collaborative school site should also provide a setting where the long-term goals required to articulate a total K-6 process curriculum could be realized. This meant that the central school district administration would have to be conceptually and financially committed to a several-year task. It also meant that the local school administrator and his staff should exhibit a similar conceptualization of the long-term nature of the task. It would not do for either group to view the task as a project to be completed and terminated in 12 or 18 months. High enthusiasm of the principal and school staff for working with ERIE and the process curricula was also considered to be an extremely important condition.

A collaborative school was selected. The most significant points about the selection procedure are that: 1) it was accomplished through the efforts of a joint task force of city school officials and ERIE staff; 2) the school district and ERIE both contributed substantially to the funding required for the project; 3) additional Title III funds were obtained by the city with ERIE's assistance to further promote the program activity; and 4) the school chosen was selected competitively from among several schools whose staffs wished to participate.

The nature of the curricula to be installed and the planned program activity were explained at a district meeting to all city school principals. Those principals interested in participating arranged meetings between their entire staff and ERIE representatives where the plan was again explained and the process curricula described. Many presentations were made, and several schools wished to participate.

ERIE's evaluation component devised a series of assessment procedures and instruments which were used with the principals and staffs of all interested schools. These procedures and measures were applied to uniformly determine the status of schools on criteria related to the overt and discreet commitment of teachers and principals to the planned installation,

augmentation, and validation activity. The joint task force analyzed the data which had been collected and selected the school judged most appropriate. The selection was followed by formal agreements between ERIE and the city relative to the terms of collaboration.

ONGOING CURRICULAR AUGMENTATION AND VALIDATION ACTIVITY

Curricular augmentation and validation activity in cooperation with a laboratory school was begun at ERIE as early as 1967 in the development of a primary reading program. However, the augmentation and validation of many other curricular components were begun only about a year ago and are currently under way.

Recent Augmentation Activity

The curricula actually chosen for installation in the collaborative school setting are listed in Table 3 of the previous paper (Cole & Seferian, 1970). After the final selection of a school site in May 1969, many mutual planning sessions occurred between the city school district, the school principal and staff, and ERIE personnel in preparation for the installation of the selected process curricula in September 1969.

Initial augmentation activity centered around teacher education. The first teacher education sessions for the new collaborative school were held in June 1969 before the new curricula had been installed. Twelve ERIE professional staff members were organized into teams, and detailed plans for a two-week inservice summer workshop for teachers were developed. The ERIE teams jointly prepared a list of objectives to be achieved by the first summer workshop. Each team then collected and developed materials for the workshop sessions. During a two-week period in July, all teachers in the collaborative school were involved in training to familiarize them with the general nature, purpose, organization, and proper utilization of the curricula to be installed (Bernstein, 1969; Berra & Simonson, 1969; McKnight, 1969; Reali & Moody, 1969).

Nearly all of the ERIE staff involved in the summer workshop activities for the collaborative school had prior experience in planning and conducting inservice teacher education workshops for the Science--A Process Approach and the Man: A Course of Study curricula. The former curriculum had been previously widely installed in an ERIE network of schools (Mahan, 1970), and the latter was being installed in a large number of elementary school classrooms under ERIE's direction. These two curricula were also among those being

installed at the collaborative school. Although it was not possible to send the appropriate teachers from the collaborative school to these other workshops, some of the experienced staff from these workshops contributed to both the planning and conducting of the collaborative school summer workshop and later academic year inservice training.

Continuing inservice teacher education during the school year had been planned from the beginning. The experience in the summer workshops indicated that it would be essential. Therefore, immediately following the summer workshops, planning and preparation for such additional teacher education was begun. Some of the goal setting and planning was mutual, occurring in sessions between groups of ERIE staff and the collaborative school teachers and administrators. As soon as school opened, regular inservice training sessions were begun. These were usually conducted for small groups of teachers by from one to three ERIE staff members. In addition, nine ERIE staff members spent two or more days a week in the collaborative school working and planning with teachers and visiting and observing their classrooms.

Additional augmentation activity began toward the end of the summer. The development of objectives and pupil tests was begun for those curricula which lacked these items. This was a major task and proved to be extremely difficult and

time consuming. ERIE staff have not been able to produce either the objectives or the tests rapidly enough to please the teachers using the curricula. Other augmentation activity was undertaken which involved the supportive articulation of other films, booklets, and instructional materials with the curricula under study in the school. Frequently, the teachers and ERIE staff would recognize that materials or procedures other than those specified for a curriculum were very appropriate to a particular lesson or unit. Sometimes, the supportive materials or procedures which could be added were more appropriate than those originally provided. The existing teacher education materials for most curricula were found to be particularly in need of such supportive augmentation.

During this activity in the new collaborative school, another ERIE team consisting of three professional staff continued to develop and to augment a primary reading program which had been initiated in an earlier ERIE laboratory school in 1967. This team also engaged in the development of objectives and materials, as well as extensive inservice teacher education activities including both summer workshops and regular academic year sessions (Mohan & Withey, 1969). This earlier laboratory school also chose to install two of the process curricula being installed in the new collaborative

school. For these two curricula, the same teams of ERIE staff served both schools, and most teacher education sessions involved teachers from both the earlier laboratory and the more recent collaborative school.

Recent Validation Activity

Early steps in the validation procedure were concerned with identifying the major behavior changes which the curricula were expected to effect in pupils and teachers. Much effort was spent in trying to identify and cluster these behaviors. Much of this activity is reported in an earlier paper (Cole & Seferian, 1970). Numerous behavioral dimensions were delineated, and many evaluative questions relative to curriculum effectiveness were raised (Berra, Calvert, Cole, et al., 1969; McKnight & Ritz, 1969; Cole, 1969a, 1969b). Further refinement of generalized teacher and pupil behavioral expectancy categories is currently under way. The further delineation of these categories has promise for the selection and development of a number of assessment techniques by which to obtain multivariate profiles on teachers and pupils prior to, during, and following their utilization of selected process curricula. Early attempts to delineate general behavioral expectancy categories for selected process curricula have stimulated an extensive search for existing instruments and techniques appropriate to the assessment of such behaviors.

The behavioral expectancy categories which are being delineated have potential for the empirical determination of which teacher and pupil behaviors are significantly related and which curricula and instructional practices are most effective in promoting specified and desired pupil and teacher behaviors.

Some past assessment activity, as well as current and planned evaluation of the effectiveness of the Man: A Course of Study curriculum in an ERIE school network has been based upon this early work (Cole, Andreas, & Archer, 1969; Herlihy, Andreas, & Archer, 1969). Ultimately, the validation of all curricula studied will need to be based upon data collected at many school sites and not just one or two collaborative schools. Plans are now under way for the further assessment of other process curricula in multiple school settings.

The validation activity which has resulted in the delineation of behavioral expectancy dimensions has also influenced teacher education activity undertaken by ERIE. As these expectancies are more clearly defined, they will define the operational objectives of teacher education for process education. As expected, the opportunity to view multiple exemplary process curricula in actual operation in the collaborative school has helped ERIE staff to further identify and define the general parameters of process education. It has also helped to determine the need for augmentation of particular

curricular components relative to the five ERIE criteria. The evaluation in the collaborative school setting has thus been primarily formative rather than summative.

Many data have been collected in the collaborative school. Prior to the introduction of the process curricula, a random sample of classrooms was selected, and the behavior of teachers and pupils was videotaped. Descriptive data have also been collected in the form of "reaction sheets," reports, and questionnaires filled out by teachers and pupils, as well as ERIE staff logs containing information resulting from the interaction, observation, and interview of teachers and pupils. Some additional videotapes have also been obtained during the current year. Most of the recorded information deals with the general characteristics of the curricula, including their instructional manageability and the reactions they evoke from teachers and pupils. The collaborative school represents a "case study" situation, and the data gathered should lead to much greater refinement of problems and questions to be intensively studied in multiple school settings in ERIE networks.

It should be recalled that the collaborative school was planned as a site where pupils and teachers would be intensively exposed to selected process curricula over a period of several years. It was expected that, given the opportunity to install

additional process curricula and to work closely with the administration and teachers, such a school and its pupils would emerge with noticeable qualitative differences relative to typical educational practice. Generally, pupils and teachers should have a greater probability of meeting the ERIE behavioral expectancies given such a long-term saturation exposure to curricula specifically designed to promote such behaviors. The collaborative school offered both an opportunity to begin the formation and articulation of a total K-6 process curriculum and the study of the long-term effect of such a curriculum. Unfortunately, this long-term goal may not be reached.

Current Status of the Collaborative School Project

In mid-November 1969, after the collaborative school project had been under way only a few months, ERIE learned it was to receive a reduction in its basic funding. Consequently, some program activity had to be curtailed. The collaborative school was a new activity with immediate payoff not commensurate with other program activities which had been under way longer and were closer to delivering tangible products and results. Consequently, as of December 31, 1969, the amount of ERIE staff and resources invested in the collaborative school and the earlier laboratory school were reduced.

There were other factors which influenced the decision to curtail the collaborative school effort. Prior to December 31, 1969, nine ERIE staff members had a nearly full-time commitment to the activity at the collaborative school site. They spent from two to four days a week actually in the one collaborative and one laboratory school where the new process curricula were being installed. The remainder of their time was largely spent in preparation for inservice teacher education activities. Little time was left to devote to the augmentation activities related to preparation of objectives, pupil tests, and evaluative techniques. Consequently, an additional four or five ERIE professional staff members were heavily involved in providing these services relative to the needs of the collaborative school. More and more ERIE resources seemed to be swallowed up by the collaborative school venture as both district administrators and the school's teachers turned to ERIE staff for assistance in solving more and more of their problems. Although many of the problems were related to the new curricula and the ERIE program activity, many were not.

Previous experience with the earlier selected laboratory school, where a similar close relationship existed between numerous ERIE staff and teachers, had shown that it was easy for the central administration and the school staff to become over-dependent upon ERIE personnel and resources. It was also easy for ERIE personnel to become over-committed

and involved in activity not directly related to program advancement. At the new collaborative school, this type of over-dependency on the part of the central administration and school staff had begun, and ERIE staff and resources had been drawn into activities not appropriate to program goals. This condition was another factor in the ERIE decision to reduce the amount of staff and resources supporting the collaborative school venture. The present ERIE staff working directly in the collaborative school now consists of only three professionals who spend no more than one day a week in the actual school and classrooms. Two of these individuals and one additional ERIE staff member also service several classrooms in the previously selected laboratory school where a reading program has been under development since 1967 and where two additional process curricula have been installed in 1969.

This reduction in the commitment of ERIE resources to the collaborative school has resulted in a decrease in both the frequency and the quality of inservice teacher education. It has also reduced the amount and variety of descriptive data which is being collected. It also seems unlikely that additional process curricula will be installed in the collaborative school next fall and in following years toward building a total K-6 process curriculum. Uncertainty of

funding for such an effort makes the long-term planning and operation of the project very difficult.

Current Augmentation and Validation Activity

Although the effort at the collaborative school has been curtailed, the concepts and activities of curriculum augmentation and validation have been broadly extended to all ERIE network schools. Negotiations are continuing with the original developers and the commercial producers of the curricula which ERIE has selected for installation, augmentation, and study. ERIE staff are now involved in the selection and development of teacher education materials designed to augment a number of existing process curricula. Objectives in the form of generalized behavioral expectancy categories for pupils and teachers using process curricula are being prepared. In collaboration with the original curriculum developers, ERIE staff has augmented curricula by preparation of specific behavioral objectives and pupil tests to be used with particular process curricula. Some of the tests have already been used in multiple school settings. Evaluative data on curriculum effectiveness is being collected in large numbers of ERIE network schools for two process curricula. Preparation for the collection of additional data for these two and all other process curricula in use in the laboratory, the collaborative, and all network schools is under way. This

assessment should provide much additional useful data relative to the effectiveness of this type of curricular and educational practice.

PROBLEMS ENCOUNTERED IN THE COLLABORATIVE SCHOOL VENTURE

In addition to the decrease in funds available and the tendency for the collaborative school relationship to become too dependent upon ERIE, other problems were encountered in the attempt to install multiple process curricula in one school. A number of these are presented in summary form below.

Problems Related to the Curricula

1. There are an insufficient number of existing process curricula components available from which to build a total K-6 curriculum.

2. The diverse content, organization, and management procedures of existing process curricula make their installation and articulation difficult.

3. Most existing process curricula are incomplete especially relative to the dimensions of teacher education and pupil assessment.

4. The cost of process curricula which tend to meet the ERIE criteria for installation is generally much greater than current educational expenditures.

Problems Related to the School and School System

1. City school officials, administrators, and teachers tend to hold oversimplified views of the objectives of process education. Many fail to recognize the inappropriateness of traditional educational practice and typical teacher and pupil classroom behavior for effective utilization of process curricula.

2. City school officials tend to view ERIE and other similar federally-funded agencies primarily as service organizations with great reserves of resources. They tend not to view such agencies as being designed to bring about change in educational practice.

3. Financial and legal restrictions imposed by school district regulations and teachers' organizations tend to prevent the flexibility needed for inservice teacher education activity and needed reorganization of school staff and resources.

4. Limitations in the physical structure of the school building and classrooms make it difficult to adapt to the multimedia nature and instructional methodology of process curricula. Poor acoustics are a particular problem. Each of the curricula installed

requires much student-directed manipulation and student-student interaction. This has frequently produced echoes and a noise level annoying to teachers. Classroom furniture tends to be another limiting factor. It is frequently less flexible than desirable for the multiple classroom activities demanded.

5. The size and structure of the city school administration tends to prevent rapid and efficient decision making and action relative to problems encountered in the collaborative effort.

6. School support service staff, such as instructional coordinators, generally tend to be involved in irrelevant tasks. Few of these people can be marshaled to provide support to teachers in the installation of curricula of the type ERIE has selected.

Problems Relating to Teachers

1. Teachers frequently view such major process curricula as Man: A Course of Study, SRA Social Science Laboratory Units, or Science--A Process Approach, as supplementary--"to be used along with"--

whatever they are doing rather than being a major portion of the curriculum.

2. Teachers generally spend inadequate time in preparation for using the curricula selected. They tend not to read the teacher's guides or to study the materials and frequently approach lessons with inadequate advance preparation. Yet, the proper utilization of these new curricula requires that teachers invest large amounts of time in preparation. Often, time is not available because of other school duties.

3. Teachers generally appear to behave quite differently from the behavioral expectancies stated for them by ERIE and the developers of the process curricula. Massive teacher education is indicated but will probably not be effective unless the teachers themselves and the school administrators both hold similar expectations for appropriate teacher behavior.

4. Although most of the teachers in the collaborative school volunteered to participate in the project, many have been fearful of having "outsiders" or other adults become involved in their classroom and teaching activities. Teachers have generally

exhibited apprehension when they have learned they are no longer to be isolated in their preparation and teaching activity. Many do not want and actively avoid the presence of other adults in their classrooms.

Problems Relating to ERIE Staff and Augmentation Activities

1. There may be no market for an augmented version of an existing curriculum. The original developers may not want pupil tests, teacher education materials, or additional evaluative data. As curricula are augmented, their cost increases. Since the process curricula chosen are already very expensive by present norms, further cost added by augmentation may prevent their wide-scale dissemination even if they are more effective as a result of the augmentation.

2. It is difficult to study a curriculum thoroughly enough so that people not involved in its original development can infer and sample proper objectives, construct appropriate teacher education materials and pupil tests, and engage in other augmentation activities.

3. It is very difficult to find personnel with the training, experience, and capability in the tasks of curriculum augmentation which include preparation

of objectives, assessment devices and tests, and instructional products. It is especially difficult to obtain personnel skilled at these tasks who also have the thorough knowledge needed to understand the multifaceted process curricula selected for study by ERIE.

4. It is difficult for the same personnel to act both as augmenters of curricular materials and as classroom consultants to teachers installing the curricula. Although the tasks are logically complementary, they greatly interfere with one another.

5. Staff assigned to augment, install, and study a process curriculum tend to fixate on the particular behavioral and organizational schema which that curriculum utilizes. This leads to communication difficulties and related problems with other staff members when dealing with generalized teacher behavioral expectancies, teacher education, and assessment designed to cut across multiple process curricula.

6. ERIE staff and management may have initially underestimated the magnitude of the effort required to augment existing curricula effectively. It appears

that curricular augmentation is, in reality, a form of further curriculum development and refinement. Although it holds promise as a method to produce more appropriate and effective educational practice, it will undoubtedly prove expensive.

7. The Generalized Synthesis Plan (Bickel & Cole, 1969) needs to be further refined, especially relative to the feasibility of curricular augmentation and validation against cost, management, time, and benefit factors. Specific procedures and mechanisms for collaboration between agencies similar to ERIE and the collaborative school in the installation, augmentation, and validation of curricula also need to be clearly specified. The experience in the collaborative school has helped to stimulate the further development of such procedures.

8. It is difficult to undertake the long-term installation, augmentation, and validation of process curricula toward articulation into a K-6 process curriculum with short-term funding. Short-term funding makes it difficult to attract and to hold the quality professional staff needed for such activity. It also interferes with establishing the necessary long-term financial support and agreements from other agencies, such as school districts and collaborative schools.

RESULTS AND CONCLUSIONS

The results and conclusions are treated in each of several categories which reflect the experience of the Institute with the installation, augmentation, and validation of process curricula in the collaborative school.

Curriculum Installation--A Difficult Task

One of the most important results of the ERIE augmentation and validation activities is the list of problems presented in the previous section. It is apparent that the proper installation of the process curricula selected by ERIE is a major task. According to Goodlad's observations, this is probably true of any innovative curriculum (1969a). Typically, one reads glowing reports which describe the successful installation of new curricula. Closer examination would probably indicate that the curricula have not been properly implemented. The problems which have been discussed above occurred even when a considerable contingent of highly competent ERIE staff was directly involved in assisting with the installation of programs which the principal and teachers wanted to and still want to adopt. It should also be recalled that the curricula chosen were much more complete and had been much more carefully developed and studied than most other existing curricula.

The Need for Augmentation

Study of selected exemplary process curricula in actual utilization in classrooms has confirmed the need for augmentation. It is particularly apparent that much more effort must be expended relative to teacher education. If teachers fail to read the teacher's guides and the other explanatory material prepared for them, it is foolish to prepare more of the same and admonish them to read it. The teacher education components which are needed for these curricula must be both motivating and easily accessible to teachers, as teachers are now. If many teachers are functionally "non-readers," the central objectives for teacher education and direction must be communicated in media other than print. Teacher education is perhaps the single most important dimension upon which all curricula studied need augmentation. Presently, many teachers do not have the capability to comprehend either the purpose or the operational meaning and related methods for the proper utilization of process curricula.

Diagnosis of pupil behavioral capability prior to and following instruction is another major dimension which needs much augmentation in all curricula studied. Presently, teachers and pupils have few indicators to use to judge their proficiency in meeting the specified program objectives.

This is almost universally true with all existing curricula and in all educational practice. The specific objectives of curricula and the relationship between objectives and the instructional transactions also need much further study and delineation.

All curricula selected by ERIE also need to be subjected to further observation in the field in multiple school settings to determine their overall effectiveness in promoting the broad objectives of process education (Goodlad, 1969b, p. 374; Cole & Seferian, 1970).

Curricular Augmentation and Validation--A Massive Task

Curricular augmentation and validation have been shown to be a massive and time-consuming effort. In a sense, it is a type of curriculum development. It is an activity which should be undertaken to help curricula become more viable and self-maintaining once they are disseminated. The need for curriculum augmentation may be decreased if future curriculum development activities give more attention to the dimensions of teacher education, objectives, and assessment of pupil behavior.

It may not be possible or feasible to massively augment specific existing curricula because of problems relating to cost, ownership of production and copyrights,

agreement on the need for augmentation, and marketing of augmented versions. A more viable approach may be to produce self-contained, generalized augmentation modules which could be effectively used with any of a large number of process curricula. For example, these modules for a teacher education program might be concerned with developing attitudes and skills which relate to the ERIE generalized "Expectancies for Teacher Behavior" (Cole, 1969a). Some materials of this type have already been produced by other agencies.

The Value of the Collaborative School Experience

The opportunity to study at first hand the process curricula selected in the ERIE search activity has greatly aided in the completion of the analysis of these curricula on the ERIE detailed criteria (Cole & Seferian, 1970). Descriptive data have also been collected which have great utility in the further planning of ongoing ERIE curriculum installation, augmentation, and validation activities.

The concepts of curricular augmentation and validation have been extended into ERIE's work with many other elementary schools and educational agencies. These notions have been sufficiently established that ERIE is also currently negotiating agreements with the original curriculum developers and commercial producers for further augmentation and study of several of the curricula selected, installed, and studied in the collaborative school.

A Word about the Quality of the Curricula Studied

One of the unfortunate results of ERIE's analysis of selected curricula against criteria for excellence is that some individuals have noted that the process curricula studied are not perfect. They imply that conventional curricular and educational practice are superior. Nothing could be further from the truth. It may not be fair to say the five curricula selected and studied by ERIE need augmentation along the dimension of teacher education. All of these curricula are so outstanding and so appropriate in terms of being designed for proper and effective educational practice that teachers and schools frequently have difficulty with them or use them improperly. What <u>really</u> needs massive revision is not these curricula but the usual and current educational practice in our schools which is incredibly illogical, inappropriate, non-functional, and unconcerned with learning (Postman & Weingartner, 1969; Cole, 1970).

SUMMARY

It was hypothesized, following the study of selected process curricula and their related theory, research, and supporting documents, that a complete curriculum needed 1) specified objectives; 2) a variety of instructional materials; 3) measures of pupil proficiency; 4) a teacher

education program; 5) evaluative techniques and data dealing with curriculum effectiveness. These five characteristics became dimensions along which augmentation of existing curricula was planned. Analysis of selected curricula against detailed criteria confirmed the need for augmentation (Cole & Seferian, 1970).

A plan for curricular augmentation and validation was developed. A collaborative school was selected where massive installation and study of process curricula could occur over a period of several years. Five process curricula were installed in the collaborative school according to the plan and earlier ERIE experience with a previous laboratory school where curriculum augmentation and validation had occurred. Augmentation activity, including preparation of objectives, pupil assessment devices, and teacher education materials and programs, was begun and is currently under way. Initial validation activity has shown that the select process curricula being studied generally need more refinement if they are to be viable and self-sustaining in multiple school settings. Many problems relating to the installation, augmentation, and study of process curricula have emerged. These problems indicate that proper installation of process curricula is a more complex and demanding task than is commonly realized. Our study indicates that the specific augmentation of particular existing curricula may not be a feasible approach. The augmentation of existing curricula through general-purpose teacher

education and instructional modules may be more appropriate and productive. Early validation activities in actual classroom settings have shown the need for augmentation of the curricula studied, especially with respect to teacher education, objectives, and pupil assessment.

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CURRICULUM INSTALLATION AND DIFFUSION STRATEGIES

James M. Mahan

In 1963, the authors of Schools for the Sixties stated the need for educators to lessen the emphasis upon content knowledge and to accentuate the development of process skills which foster the continuous discovery of information and the productive utilization of information across a lifetime.

BACKGROUND OF ERIE'S EFFORT

The Eastern Regional Institute for Education (ERIE), since its founding in 1966, has recognized the instructional potential of various process-oriented and inquiry-oriented curricula. As an institutional proponent of process education, ERIE faced a decision of whether to work for the installation of process curricula in the schools of the region by means of speeches, journal articles, and audio visual presentations or by means of exemplary field demonstrations. ERIE administrators reasoned that an effective way of accomplishing curriculum change was to identify a sound, tested curriculum and to act immediately to give it reality in specific pilot schools rather than to plead for its future consideration by educators in general.

Reviews of the literature on educational change, i.e. Guba (1967), indicated that many recent instructional innovations became white elephants after leaving the hands of the curriculum developers. Several authors lamented the absence

of support mechanisms designed to fit new programs into schools and to nourish and maintain programs until school staffs were able to use the programs on a routine, comfortable, permanent basis. There seemed to be no tried and true formula available for the successful introduction of a process curriculum into schools of diverse characteristics. The words of Geis (1968) express a similar feeling:

> The history of educational innovation, as we read it, was dismal. It was marked by disappointment, disillusionment and despair both on the part of the innovators and those for whom the innovations were designed. Repeatedly, under quite different conditions, innovations were introduced only to fail a short time later [p.3].

Thus, ERIE identified Science--A Process Approach, the kindergarten through sixth grade elementary school science program developed by the American Association for the Advancement of Science (AAAS), as a process-promoting curricular vehicle to be used in the development and testing of a curriculum installation and diffusion strategy. Worthy of immediate use by schools as a result of thorough development and extensive field tryout by AAAS, Science--A Process Approach provided ERIE with the opportunity to move a proven educational innovation into immediate and widespread use. It was hypothesized that while process-oriented science education was being introduced to large numbers of teachers and pupils, an installation strategy could be tested and modified. Introduction of other process-promoting curricula, it was further hypothesized, could be achieved more rapidly and more effectively by ERIE

in the years ahead through the re-employment of the basic installation strategy and its relevant modifications.

OBJECTIVES FOR THE PROCESS CURRICULUM INSTALLATION AND DIFFUSION EFFORT

The ERIE staff established three major objectives for its process curriculum installation and diffusion effort--each with several measurable subobjectives. These objectives represent long term, continuing goals. The attainment of these goals is being evaluated according to the priorities of the Institute, the availability of fiscal and human resources, and the unique conditions and preferences of the collaborating pilot schools. Each of the major objectives and associated subobjectives follow:

Objective #1 - To install process-oriented curricula in grades K-6 of elementary schools of diverse characteristics.

Subobjectives

(a) To monitor the installation to determine if sufficient instructional time is allotted the specific curriculum to permit completion of the syllabus (a quantity criterion).

(b) To monitor the installation to determine if the specific process curriculum is taught within the parameters of the teacher instructional

behavior and the pupil classroom behavior prescribed by the curriculum developers (a quality criterion).

(c) To monitor the installation to determine the adequacy of pupil achievement (a pupil achievement criterion).

(d) To monitor the installation to determine if teachers and administrators voluntarily accept and subsequently approve the specific curriculum (an attitudinal criterion).

(e) To monitor the installation to determine if the process-oriented curriculum is supported with local funds as change agency support is withdrawn (an institutionalization criterion).

Objective #2 - To develop strategies for the installation of process-oriented curricula in elementary schools of diverse characteristics.

Subobjectives

(a) To create effective selection procedures for determining which pilot schools will collaborate in curriculum installation efforts.

(b) To establish an effective inservice education component for the basic installation strategy.

(c) To establish an effective classroom consultant component for the basic installation strategy.

(d) To establish an effective equipment and materials provision and maintenance component for the basic installation strategy.

(e) To establish clear and effective roles and responsibilities, mutually accepted by each educator involved in the curriculum installation effort.

(f) To establish performance goals and related feedback mechanisms for the curriculum installation effort.

(g) To compare the results of the basic installation strategy with the results obtained from modifications of the strategy, or from independent strategies used by others.

(h) To modify (refine) one or more components of the installation strategy to maximize its effectiveness in selected pilot schools.

Objective #3 - To activate other agencies and educators to demonstrate, install, and/or support the installation of process-oriented curricula in grades K-6 of elementary schools of diverse characteristics.

Subobjectives

(a) To activate school districts to install process-oriented curricula in non-ERIE affiliated elementary schools.

(b) To activate regional Title III centers, state education departments, Boards of Cooperative Educational Services, other intermediate educational units, colleges, and universities to install process-oriented curricula or to provide inservice and preservice education to develop process-oriented teachers.

(c) To activate college professors to supply supportive service and direct consultant assistance to elementary schools engaged in the installation of process-oriented curricula.

(d) To activate college professors to modify preservice course offerings in order to prepare beginning teachers to utilize process-oriented curricula.

(e) To activate a large number of regionally distributed pilot schools to demonstrate, in the classroom, functioning process-oriented curricula to teachers and administrators from the surrounding subregion.

THE INITIAL INSTALLATION AND DIFFUSION STRATEGY

Goodlad (1967) contends that whatever educational changes which are deemed desirable should be brought about in the school building as the single, comprehensive unit. Central office and school district mechanisms are accorded only supportive functions in the educational change process by Goodlad, and he cautions that buildings must be selected carefully to represent the rich diversity of schools and school problems found in America. Brickell (1961) also calls for school building demonstration units manned by regular teachers functioning in their normal classroom environment.

The arguments of Goodlad and Brickell seemed cogent to ERIE staff members and it was decided to attempt the installation of Science--A Process Approach in twenty-one elementary school buildings. Once the curriculum was successfully implemented, these same buildings were expected to become demonstration centers for the diffusion of the science program to other schools in the geographic region.

As a new change agency faced with the challenge of producing a visible, operating program immediately, ERIE turned to the literature of change for insights that would optimize the odds for the success of the curriculum installation. Woods (1967) writes:

> The load on teachers at all levels and at all times is heavy, and it is difficult enough for them to conduct existing programs, much less carry out new ones. With a busy person every little bit helps--workshops, materials, guides, consultants--and anyone of these may make the difference between adoption and rejection [p.57].

Brickell (1961) emphasized the same need for comprehensive supportive services to innovating teachers as a result of his study of change in New York State:

> The most successful innovations are those which are accompanied by the most elaborate help to teachers as they begin to provide the new instruction--- It became vividly clear during the survey observations that the key to successful innovation is assistance to the teachers. The surest way to guarantee the successful introduction of a new program is to supply teachers with all the help they need in moving into the new approach [pp.31-32].

Based on these recommendations, an ERIE-financed installation and diffusion strategy containing several components was planned in the spring of 1967 so that Science--A Process Approach would be in use in 21 schools in September, 1967.

A number of assumptions undergirded a rather eclectic approach to curriculum installation and diffusion. Major assumptions are outlined below; relevant strategic program inputs are described under each specific assumption.

A. *INITIATING THE INSTALLATION EFFORT*

Assumption #1 - In order for educational change to occur, it must be stimulated.

- ERIE offered full financing of all aspects of the installation effort for two years on each grade level involved.

Assumption #2 - Collaboration with established educational agencies and prominent regional educators enhances the credibility of a new change agency and generates early support for its programs.

- Regional Title III Center directors, State Education Department personnel, members of the ERIE Board of Trustees, school superintendents, School of Education professors, and ERIE staff associates nominated school districts from which pilot schools might be selected.

B. *SELECTING THE PILOT SCHOOLS*

Assumption #3 - The establishment of a personal relationship with prospective clients leads to a more rational selection of pilot schools.

- ERIE staff associates visited each nominated district, conversed with the superintendent, met with elementary school principals, and

toured buildings under consideration for pilot status. The science curriculum was discussed in detail.

Assumption #4 - Administrative approval and support are necessary for successful installation.

- If the school superintendent and building principal requested to participate, the school was placed on the final list of candidates.

Assumption #5 - Schools of diverse characteristics are required for the testing of installation procedures and are essential as credible curriculum diffusion sites.

- ERIE administrators selected 21 elementary schools representing varying socio-economic environments, heterogeneous student populations, etc., to serve as geographically distributed pilot schools.
- American Institutes for Research independently verified the diversity of the schools.

C. *PARTICIPATORY DECISIONS BY VOLUNTARY, INFORMED TEACHERS*

Assumption #6 - Teachers cannot be ordered to teach an innovative program.

- Principals were requested to identify only volunteer teachers for participation in the curriculum installation.

- Two teacher-leaders per pilot school attended a conference at ERIE, analyzed the curriculum, discussed the installation strategy, conveyed information to teaching colleagues, and confirmed continued interest of colleagues.
- Science--A Process Approach descriptive brochures were distributed to all schools.

Assumption #7 - Teachers should receive compensation and professional recognition for activities required beyond regularly scheduled instructional requirements.

- ERIE offered an honorarium to each teacher attending the workshop and providing feedback data throughout the year.
- Three hours graduate credit at a major university was arranged for the workshop and implementation of the curriculum.

D. *INSERVICE EDUCATION AND REGULAR CONSULTANT SERVICE*

Assumption #8 - Preservice or inservice training is necessary for the proper installation of an innovative program.

- A week-long workshop was required and conducted for all 240 participating teachers of grades K-3.
- A two-day workshop for all pilot building principals was required and conducted.

Assumption #9 - Innovating teachers must be provided with the services of nondirective, helping professionals.

- Biweekly consultant visits by knowledgeable, ERIE Science--A Process Approach consultants were scheduled for every pilot school.
- Consultants served in an "on-call" capacity, entering classrooms only when invited.

E. CURRICULUM RELATED HARDWARE AND SOFTWARE

Assumption #10 - All necessary equipment and supplies, including replacement materials, should be provided to the teacher.

- One science kit was provided per every two teachers.
- Teachers who "shared" a kit were provided individually with a set of expendable materials.
- Each school received a petty cash allotment based on the number of innovating teachers.
- ERIE handled all delivery problems, breakage, etc., with the vendors.

F. *INSTALLATION GOALS AND PARTICIPANT ROLES AND RESPONSIBILITIES*

Assumption #11 - Formal performance goals and formal roles and responsibilities for collaborating personnel should not be prescribed if the natural results of a curriculum installation strategy are to be determined.

- ERIE originally established no quantity or quality goals for the science exercises to be taught.
- A "successful" curriculum installation was not defined.
- Criteria for continued ERIE--pilot school collaboration were not established.
- Roles and responsibilities for ERIE consultants, classroom teachers, principals, and science supervisors were not outlined.

G. *COMMUNICATION AND FEEDBACK MECHANISMS*

Assumption #12 - Continuous two-way communication between change agency and pilot school personnel is required for successful curriculum installation.

- "Hot Line," collect call telephone service was initiated with all schools on a permanent basis.
- Letters and newsletters were mailed to all teachers.

- Consultants served in pilot buildings as "Good Listeners" and messengers to ERIE.
- Pilot principal follow-up meetings were scheduled at six-month intervals.
- Teachers, through the consultant, submitted student achievement data and evaluated each science exercise.
- A carefully limited number of questionnaires was mailed to participating teachers or administered by nonconsulting ERIE staff members.

H. PROVIDING FOR CURRICULUM DIFFUSION

Assumption #13 - Teachers, apprehensive during their first months with new instructional procedures, resist the scheduling of visitors into their classrooms.

- No pilot schools were asked to demonstrate the science program during the first year of its use.
- ERIE staff members conducted curriculum Dissemination Days in collaboration with Regional Title III Centers and School Study Councils.

Assumption #14 - The best way to judge a new program is to see it in operation in a school similar to your own.

- With Regional Title III Centers as organizers, a series of pilot school curriculum Demonstration Days were conducted during the second year of the installation.

Assumption #15 - A validated, well demonstrated curriculum will spread far beyond the service capacity of a single educational change agency and others must be actuated to replicate initial installation and diffusion efforts.

- State Education Department funds were obtained to subsidize inservice education for interested teachers and principals.
- Several large on-campus workshops were established to meet inservice education demands in New York State and Pennsylvania.
- A Regional Action Network (RAN) of college professors, under National Science Foundation support, was prepared to serve as a support mechanism to assist schools in selecting and implementing process-oriented elementary science programs.

- Mailings to every elementary school facilitated interest in Science--A Process Approach, publicized inservice education opportunities, and created awareness of the supportive potential of Regional Action Network professors.

The ERIE strategy for diffusing Science--A Process Approach was modeled closely upon the five stages in the adoption of an innovation described by Rogers (1962). The awareness stage was provided for through descriptive brochures and examination of materials at Dissemination Days. On-site Demonstration Days were critical during the interest stage. The evaluation stage, a time of mental trial and preliminary decision, was influenced by provision of cost information, acceptance of telephone calls, referral to commercial vendors, etc. ERIE initiated regional workshops which served as the trial stage where potential adoptors came to master the content and intent of the curriculum. Upon return home, the workshop participants taught the program to determine whether in the adoption stage the local district should elect to expand or curtail the innovation.

MODIFICATIONS TO THE INITIAL CURRICULUM INSTALLATION AND DIFFUSION STRATEGY

Late in the second year of the pilot school science installation endeavor, ERIE prepared to launch two more large and independent curriculum installation efforts. The State Education Departments of New York and Pennsylvania offered to support partially the establishment of thirty-two geographically distributed process education demonstration schools. The National Science Foundation agreed to provide partial support for the establishment of Man: A Course of Study demonstration schools in the same two states. ERIE analyzed the shortcomings and successes of the pilot school procedures in search of alternatives that would optimize chances for two successful second generation curriculum installations.

An examination of pilot school feedback data indicated that Science--A Process Approach was installed in varying degrees of success within widely divergent parameters of local school commitment. Some faculties taught nearly all the syllabus--some nearly none. Many teachers honored the sequential nature of the science program while others ignored the carefully structured hierarchical objectives. In some schools the consultant was a dynamic participant-observer and in other schools he was virtually unused. Although the program was diffusing rapidly to other elementary school buildings in the pilot districts, in the pilot buildings the curriculum was often referred to as "ERIE's Program."

Each one of the assumptions that undergirded the initial installation strategy was carefully re-examined in the light of two years' field experience, questionnaire data, consultant observations, and recorded instructional progress. The following chart (Table 1) indicates the outcome of a reappraisal of basic assumptions and briefly cites major changes in ERIE procedures for the September, 1969, installations.

TABLE 1

ERIE's Reappraisal of Fifteen Basic Assumptions on Curriculum Installation and Diffusion: Based on Two Years' Field Experience

ASSUMPTION (1-15)	Retained	Rejected	Modified	COMMENTS AND NEW PROCEDURES
1. Stimulate Change	x		x	Availability of full fiscal support by change agency short circuited local district identification of curricula needs, fostered dependency, restricted local leadership and concern. • At least 60% of cost of new installations assigned to local districts.
2. Interagency Collaboration	x			Productive assumption
3. Personal Relationship	x		x	Selection of pilot schools after visitation resulted in some "friendship" and "politics" decisions. • Title III Centers and state education departments selected new schools. • Personal relationships established in group setting at Orientation Days where selectees confirmed desire to participate or withdraw.
4. Administrative Approval	x			Productive assumption.
5. Diverse Schools	x			Essential for curriculum demonstration purposes.
6. Teacher Volunteers	x		x	Volunteer teachers were often "volunteered" teachers. • Installation goals, roles, and responsibilities mailed to faculties as data for use in decision making. • Teachers represented at Orientation Meetings as well as administrators.
7. Teacher Compensation		x		Some teachers volunteered because of the workshop honorarium. Others expected continuing compensation for data provision. Local district failed to budget for inservice education. • Full expense of teacher compensation assigned to local district.
8. Inservice Education	x		x	Teachers rated the science workshops as most important component of the installation strategy • Principals required to participate in workshops with teachers. • Increased attention to teacher behaviors.

(more)

TABLE 1 (cont'd)

ASSUMPTION (1-15)	Retained	Rejected	Modified	COMMENTS AND NEW PROCEDURES
9. Consultant Service	x		x	On call, nondirective consultant service generally ineffectively utilized by pilot school teachers. • Consultant role redefined to include heavy emphasis on demonstration teaching, classroom observation with follow-up conferences, and shared teaching responsibilities. • Classroom established as the scene of teacher-consultant interaction. • Analyses made of how consultants use their time. • Consultants required to report on selected teacher instructional behaviors. • Analysis made of types of questions asked of consultants by teachers.
10. Equipment & Supplies	x		x	Equipment a necessity but free provision fostered dependency. Petty cash fund precluded local initiative. • Half of cost of all equipment paid by local district. • All petty cash provided by local district.
11. No Formal Goals & Roles		x		In the absence of instructional goals and roles and responsibilities for collaborators, "anything went" and was defined as "good" locally. Performance varied greatly from room to room, school to school. • Instructional standards for quantity and quality established. • Time requirements stated in advance. • Responsibilities of teachers, principals, science supervisors, consultants circulated in writing in advance.
12. Communication Feedback	x		x	• Teacher behavior discussed in correspondence. • Teacher-leaders also included in Principals' Follow-Up Conferences. • Periodic instructional progress reports circulated to all teachers, principals, and superintendents.
13. Year Moratorium on Demonstration	x			Teachers appreciate chance to "get experience."
14. Series of Demonstration Days	x			Very productive assumption. • Two or three Demonstration Days per each new school scheduled for 1970-71.
15. Others must Replicate	x			• Regional Action Network professors serve as consultants to 32 schools, organize and administrate regional inservice education workshops, and assist surrounding districts to improve science education.

Table 1 indicates that Assumptions 2, 4, 5, 13, 14 and 15, along with their installation procedures were considered valid contributors to the effectiveness of a curriculum installation and diffusion strategy. Similar procedures were employed in managing the new installation. Assumptions 1, 3, 6, 8, 9, 10 and 12 were retained on the basis of field results but the degree or nature of the accompanying procedures were modified. Assumptions 7 and 11 were rejected prior to the new installation. Pilot school progress seemed erratic in the absence of formal goals. Responsibilities seemed to be centered in the change agency. Pilot schools did not exercise the self-initiative which is necessary when a change agency disengages from a client system. Formal goals were established prior to demonstration school application. These goals have enhanced communication, facilitated progress evaluation, and made local school personnel more capable of monitoring and judging their own performance. Teacher compensation was deemed a local responsibility. Assuming that districts identify educational needs before requesting to implement curricula programs offered by change agencies, there is no reason a change agency should directly pay teachers to meet local district needs. The local taxpayer already makes such payment. In the absence of change agency stipends, applicant districts did pay their own teachers and more schools made application to participate in the new installations than could be accommodated. Change in the ERIE

demonstration schools has been stimulated more by the innovator's dissatisfaction with traditional programs and with his knowledge of the potential and characteristics of emergent programs and less by "a chance to try something for free." Preliminary 1969-1970 instructional progress indicates that greater classroom time commitment tends to accompany larger investments of local dollars.

SUMMARY

The curriculum installation strategy and modifications described in this paper have been used to implement Science--A Process Approach in 53 elementary schools of New York and Pennsylvania. To date, no schools have dropped the program once it was begun. The inservice education component and the equipment provision component of the installation strategy have provided the common teacher knowledge and the common physical resources necessary if school installations are to be compared. Consultants from the ERIE staff or from the professors of the Regional Action Network have rendered direct, continuing assistance to classroom teachers. Furthermore, these consultants have verified the degree to which the curriculum is actually implemented by teachers, the attitude of the teachers toward the curriculum, and the interest and support given to the installation by local administrators.

A large amount of research data has been collected

which indicates that teachers are devoting more time to science education now than prior to the installation, that process education is acceptable to teachers and does not conflict with content-oriented curricula, and that teachers do practice certain nondirective behaviors when teaching the science program. Pupil achievement data show that the responses of children to the competency measure tasks that are integral parts of each Science--A Process Approach exercise are correct in over 80 percent of the cases.

ERIE has discontinued all financial aid, except consultant service, to grades K-3 of pilot schools. The local districts have assumed the costs of training replacement teachers and providing expendable materials for these four grades.

Under local tax support, the pilot districts have organized and financed the expansion of the science program for 12,000 students enrolled in non-ERIE affiliated buildings. From these examples of local innovative initiative it may be inferred that the science program is being institutionalized and will prevail--after ERIE totally disengages from the collaborative effort in June, 1972.

Besides assisting their own students to develop process skills pertinent to scientific activities, teachers and principals of pilot schools have willingly demonstrated the innovative curriculum to hundreds of other educators in the subregion. Approximately 20 well-attended Demonstration Days were conducted over the past two years. Visitors to the pilot

schools have welcomed this natural way of examining new curricula in a functional setting. Demonstration Day attendance has led to participation in ERIE sponsored inservice workshops by additional adopters of the curriculum. Many pilot districts have organized their own inservice workshops using pilot school teachers as core members of the instructional staff and inviting educators from neighboring districts to participate. ERIE has noted the extensive proliferation of a new curriculum which occurs when an organized group of pilot buildings serve as both dissemination sites and training sources. The number of children receiving Science--A Process Approach has increased from 8,000 to 57,000 in only three school years as others have replicated the ERIE installation and diffusion strategy described in this paper.

Finally, the consultant monitoring feature of the installation strategy has facilitated the collection of a variety of data pertinent to curriculum installation. Recorded in the classrooms and school offices over a period of three years, the data will permit ERIE to discuss such questions as:

> What expectations do teachers hold for the behavior of external consultants?
>
> What teacher and school demographic characteristics are related to successful curriculum installation?
>
> What attributes of school organizational climate are related to successful curriculum installation?

What personality characteristics of classroom teachers are related to successful curriculum installation?

What variables are identified by teachers, principals, and consultants as major deterrents to curriculum installation?*

* A paper prepared by Richard Andrulis presents data bearing upon some of these questions (see pp. 165-93). Additional research reports on curriculum installation will be available in limited numbers from ERIE by September, 1970.

Appendix A

SELECTED DATA GERMANE TO ERIE'S INSTALLATION AND DIFFUSION ACTIVITIES

1. *What does it cost change agencies to establish Process Education Demonstration Schools if local districts finance 50% of the effort?*

Science--A Process Approach has been introduced into grades K-2 of 32 demonstration schools in 1969-70. During 1970-71 the science program will be expanded to grade 3 while Materials and Activities for Teachers and Children (MATCH Units) are introduced in grades 3-6 of the same schools. Unit costs indicated in the table below include all the components of the installation strategy--inservice education, equipment, syllabi, 13 regularly scheduled consultant visits, communication and feedback, and ERIE coordination.

Financing Demonstration Schools
Contribution of Change Agencies

Unit	Total Units 1969-70	Total Units 1970-71	Cost/Unit 1969-70	Cost/Unit 1970-71
School	32	32	$3,539.00*	$2,378.00
Teacher	226	312	501.00*	244.00
Pupil	6,780	13,200**	16.70*	5.76

* 1969-70 figures include the initial (one-time only) cost of training college professors to serve as school consultants.

** Includes approximately 120 students per school who will use MATCH Units in grades 4, 5, 6 in 1970-71.

2. *What has been the regional impact of the ERIE installation and diffusion strategy upon classroom practice?*

The total number of students receiving Science--A Process Approach instruction as a result of ERIE or ERIE-influenced efforts has grown as displayed below. These figures were obtained by multiplying the number of teachers attending ERIE-sponsored inservice education workshops by a class size of 30.

Diffusion of Science--A Process Approach

	1967-68	1968-69	1969-70	1970-71
Students	8,000	28,000	57,000	?

3. *How many elementary school teachers have participated in the week-long ERIE sponsored inservice education workshops conducted on college campuses?*

Participation in ERIE-Sponsored Workshops

	1967-68	1968-69	1969-70
Number of Districts	21	94	106
Number of Teachers	240	513	581

4. *How many science exercises have been taught in the past by pilot school teachers? What has been the attitude of pilot teachers toward these exercises? Based on available 1969-70 data, how does demonstration school instructional progress and attitude compare with pilot school instructional progress and attitude?*

There are approximately 23 science exercises to be taught on each grade level. Approximately 120 to 150 minutes are required to teach one exercise. In practice, teachers tend to spread one exercise over a

ten-day to two-week calendar interval. There has been a tendency for pilot schools to schedule increasing time to science education during each year of the installation effort.

Science Exercises Completed and Related Teacher Attitude

Site	Mean Exercises Taught Per Teacher				Mean Teacher Attitude/Ex.	
	1967-68	1968-69	1st Semester 1969-70	1969-70	1968-69	1969-70
Original (pilot) Installation	12.8	14.8	8.2	18.0 (est.)	**7.3	
Second (Demonstration) Installation	-	-	8.9*	20.0 (est.)	**7.1	

* Demonstration school teachers under conditions of the modified installation strategy taught 9 percent more science exercises during their first semester in the program than did pilot teachers during the comparable calendar interval in the third year of the pilot school installation. The demonstration school teachers taught 2.1 times more science exercises in their first semester of the installation that did pilot teachers in their first semester.

** Teacher attitudes were obtained from teacher responses to the following question completed at the instructional conclusion of each science exercise:

As teacher, how satisfied were you with the instructional value of this science exercise for your pupils?

1	2	3	4	5	6	7	8	9
Completely Dissatisfied								Completely Satisfied

Demonstration teachers endorsed the science exercises (7.1) almost as highly as pilot teachers (7.3) despite the fact that demonstration teachers were encountering the strange exercises for the first time.

5. *How was consultant time utilized by teachers when consultant roles were unstructured and nondirective? How is consultant time being utilized by teachers when consultant roles are structured and classroom based?*

Utilization of Consultant Time
By Pilot and Demonstration School Teachers

	Mean Teachers Per School	Mean Teacher-Consultant Conferences Per Visit	Mean Classroom Demonstrations Per Visit	Mean Classroom Observations Per Visit
Pilot Schools (1968-69) Unstructured	15.0	11.0	.3	1.1
Demonstration Schools (1st 10 weeks) Structured (1969-70)	7.0	6.8	1.1	3.0

Assuming that a consultant demonstration or observation requires 35 minutes in the classroom, consultants are spending about 144 minutes (4.1 x 35) per school visit in direct contact with teachers and children during 1969-70. In 1968-69 the comparable figure was 49 minutes (1.4 x 35). More time inside the classroom increases the opportunities to assist teachers to modify their instructional behaviors.

6. *In what types of science education leadership activities have the ERIE-sponsored Regional Action Network professors engaged?**

ERIE, under support from the National Science Foundation, has trained 50 professors of science and science methods from 41 colleges and universities to serve as supportive personnel for science curriculum innovation. These professors have participated in a variety of regional activities designed to improve elementary school science education.

Major Regional Action Network Activities

38 professors serve as consultants to pilot and demonstration schools
11 professors served as workshop staff members (August, 1969)
5 professors were administrators of large inservice workshops (summer, 1969)
5 professors submitted NSF proposals during 1969--at least three funded
2 professors attended a week-long seminar on Science Curriculum Improvement Study
3 professors wrote journal articles relative to their RAN activities
3 professors hosted college conferences on two or more emerging curricula
15 professors delivered keynote addresses at Curriculum Demonstration Days in pilot schools

*A description of Regional Action Network training and activities is contained in: Mahan, James M. "Involving the University Professor in Curriculum Innovation," Syracuse, New York, Eastern Regional Institute for Education, January 1970.

7. *What types of questions do teachers ask of external science consultants? What types of requests for services do teachers make of external science consultants?*

The nature of the interaction between an external consultant and an innovating teacher is of considerable concern to any agency that employs consultants to support and monitor curriculum installation. The general assumption seems to be that teachers assemble their equipment problems, save their content questions, and ready their methodological challenges for the next appearance of the external expert. Consultants expect teachers to come to them with questions and requests all designed to help the teacher over difficult portions of the new curriculum. Consultant service is traditionally equated with continuing inservice education. Yet, in practice, consultants often visit schools where no teachers are teaching the innovative program on that day, where little has been taught on preceding days, and where teachers seem to prefer that the consultant remain in the lounge "on call" rather than in the classroom "on duty." The ERIE staff decided that a classification of the types of questions asked of consultants by teachers was one way to analyze the nature of consultant utilization in ERIE affiliated schools. After a few moments of social interchange, each consultant sought a task orientation for the teacher-consultant encounter by posing a question relevant to science instruction in the specific classroom. The first four questions or requests verbalized

by the teacher in the remainder of the encounter were recorded in the proper category. If a teacher asked no questions, she was credited with four entries in the Abstaining category. If she asked only one question, it was recorded in the proper category and three additional entries made in the Abstaining category. An analysis of the data revealed that many teachers tend not to have four questions to ask of a consultant and that many others have only socializing questions to ask. Serious concern has been generated over the effectiveness of unstructured consultant service in modifying teacher classroom behavior, evaluating the quality of an installation, assessing student performance, demonstrating the methodology of the curriculum, or transferring process skills from one curriculum to another. Teachers tend not to make these kinds of requests or raise questions in these areas.

The table on the following page indicates the distribution of teacher questions and requests across 14 consultant typology categories.

Percentage Distribution of Questions Asked
of Consultants by Pilot and by Demonstration School Teachers:
by Type of Question Asked

Type of Question or Request	Percentage Distribution of Questions Asked by Pilot Teachers January-June, 1969	Percentage Distribution of Questions Asked by Demonstration Teachers Sept. 1969-Jan. 1970
Educating	21.0%	23.0%
Demonstrating	5.0	10.0
Evaluating & Reassuring	14.0	21.0
Integrating	0.5	2.0
Procuring	9.0	8.0
Messengering	2.0	3.0
Disseminating	3.0	2.0
Intervening	1.0	1.0
Legitimatizing	2.0	3.0
Obfuscating	0.5	0.5
Rejecting	2.0	0.5
Socializing	13.0	4.0
Clerical-Custodial	0.5	1.0
Abstaining (nothing asked)	26.0	21.0
	N = 3,614 queries 307 teachers	N = 5,235 queries 224 teachers

8. *What Science--A Process Approach student achievement data is collected by ERIE? Are students able to perform competency measure tasks correctly?*

Teachers conclude each Science--A Process Approach exercise by administering competency measure tasks to a random sample of three students. The competency measure tasks test student attainment of one or more of the behavioral objectives stated for each exercise. The tasks employed generally call for the use of content material different from that of the instructional activities of the exercise. The varied content materials focus instructional evaluation upon observable child performances, rather than upon the recall of memorized facts or the recognition of previously handled materials. ERIE collects competency measure summation cards from every pilot and demonstration school teacher and periodically reports achievement data. The following table indicates the degree to which approximately 150 first grade students were able to respond correctly to grade one (Part B) competency measure tasks during 1968-69. Most of these first graders had received Science--A Process Approach instruction during the 1967-68 school year. Over 80 percent of the children tested tended to respond correctly to 109 of the Part B competency measure tasks. Less than 80 percent of the children tested responded correctly to the remaining 41 tasks. ERIE staff members have

analyzed these achievement figures against the wording and demands of specific competency measure tasks. Often ambiguous wording or expected student behaviors unrelated to the behavioral objectives of the specific science exercise are found to be the cause of a high incidence of incorrect student response. Task #10 in exercise "g" is a good example of a curriculum developer's error that slipped through the tryout stage and was incorporated into commercial editions of the syllabus. Teacher attitude toward each Part B exercise is indicated in the far right column. The maximum favorable score is 9.0; the minimum favorable score is 1.0. Fifty first grade teachers in pilot schools tended to have strong positive attitudes toward the 26 exercises that constitute the Part B syllabus.

Competency Measure Performance in ERIE Pilot Schools

Science--A Process Approach: Part B (First Grade)

Exercise Letter	No. of Pupils Tested	Percentage of Correct Responses														Mean Teacher Attitude Toward Exercise
		Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Task 7	Task 8	Task 9	Task 10	Task 11	Task 12	Task 13	Task 14	
a	201	89.6	94.5	89.1												8.2
b	198	82.8	97.5	91.9	85.9	87.9	66.7	85.4	81.8	71.2						8.9
c	201	97.0	89.6	60.7	84.1	74.6	47.8	64.7	71.1	79.6						7.0
d	195	83.6	85.1	92.3	75.9											6.3
e	201	84.6	96.0	89.1	79.1											7.7
f	198	96.5	99.5	98.0	77.3	61.1	78.8									7.5
g	198	90.4	89.4	88.9	92.9	63.1	91.4	94.4	90.9	43.9	35.9	67.2	85.9	80.8	86.4	7.5
h	201	78.6	78.1	83.1	85.6											7.5
i	201	90.1	86.6	94.0	85.1											7.5
j	174	97.1	73.6	83.9	83.3	78.7										6.9
k	192	90.1	78.7	85.9	94.8	86.5	85.9	86.5	83.9	79.6						7.6
l	168	88.1	79.8	77.4	77.4	67.9	83.3	78.6	79.8	79.2						6.8
m	185	71.4	97.3	89.2												7.9
n	171	95.3	93.6	92.4	97.1	91.2										7.7
o	165	95.8	97.6	95.2												7.8
p	153	93.5	92.8	75.2	76.5	97.4	83.0	83.0	92.8	80.4	79.7	92.8				7.2
q	105	91.4	89.5	82.9	94.3	90.5	89.5	89.5								7.8
r	165	95.8	88.5	98.8	98.2	97.6	97.6	92.1	75.2	98.2	84.2					7.1
s	126	78.6	93.7	84.9	92.1	84.1	89.7	84.7								7.0
t	81	100.0	91.4													7.0
u	78	91.0	88.5	70.5	88.5	78.2	79.5									6.6
v	66	93.9	93.9	98.5	95.5											7.5
w	90	95.6	84.4													7.5
x	54	92.6	88.9	98.2	79.6	90.7										7.0
y	54	96.3	87.0													7.1
z	72	93.1	90.3	77.8												7.6

Total number of pupils tested: 3,893

Average number of pupils per exersise: 150

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EVALUATION OF CURRICULAR PROGRAMS

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INTRODUCTION

The decade of the 1960s has witnessed the investment of billions of dollars by the Federal government and private foundations in the attempt to improve education in the nation's schools. What effect has this expenditure had on the improvement of school programs? How wisely have these dollars been spent? What factors contribute to effective improvement of school programs? These questions, among many others, have been asked by the funding agencies; answers must be provided.

The task of answering these questions falls upon educational evaluators and researchers. During the past decade, the profession has reviewed possible means of gathering data bearing on these questions. Existing methodologies and goals of evaluation have not been adequate for the task and consequently are requiring considerable re-examination. Scholars from diverse fields have tried to conceptualize and implement new approaches. Although substantial advances have been made toward the delineation of a new evaluation theory and new methodologies, much remains to be done before answers can be given to the many legitimate questions which have been raised.

Among the new approaches for coping with the emerging problems of evaluation of new curricula and new programs, the concept of systems analysis has great appeal to educational planners or evaluators. Systems analysis can provide a means for systematizing efforts and conceptualizing approaches in the evaluation of the degree to which program outcomes have been attained (Schutz, 1969). While the application of the systems analytic paradigm to educational problems involves a considerable amount of "slippage" when compared with its application to engineering problems, the techniques provide valuable insights which may assist the educational planner and evaluator to do a more adequate job.

The purpose of this presentation is to demonstrate the capabilities and limitations of systems analysis as applied to the development of a program evaluation plan. This paper will present a very limited review of current evaluation theory and general systems theory; the development of a general model for educational evaluation will be presented and applied to an evaluation plan for the Eastern Regional Institute for Education (ERIE).

SELECTED CONCEPTS IN EVALUATION THEORY

Recent developments in evaluation theory have centered around the function of evaluation in decision-making. An influential article, "Evaluation for Course Improvement,"

by Lee J. Cronbach (1964) formally ushered in this orientation. Significant contributions by Michael Scriven (1967), Robert Stake (1967) and Garlie Forehand (1968) provided the basis for the model to be developed in this presentation. The orientation taken by the authors is best expressed by Daniel Stufflebeam (1969).

In a symposium entitled "The World of Evaluation Needs Reshaping," at the 1969 American Educational Research Association's convention, Stufflebeam presented the outline of an emergent theory of evaluation currently being developed by the Phi Delta Kappa National Study Commission on Evaluation.

Stufflebeam identified several premises which form the foundation for this emergent theory; these premises specify aspects of the decision-making process and deal with information theory requirements, the specification of evaluation strategies in relation to different educational settings, and the like. Based on these premises, the Commission has defined evaluation as follows: "Evaluation is the process of defining, obtaining, and using information to judge decision alternatives" (Stufflebeam, 1969, p.2).

The first aspect of the definition, relative to defining information requirements, essentially asks the questions:

1. Who are the decision makers?

2. What decisions are to be made?

3. What alternatives are available?

4. What kind of information is important?

The processes of attaining and utilizing the information must be cast within the framework of the decision maker's questions. Evaluative information must meet the scientific criteria which are necessary for all good information, i.e., it must be reliable and valid. The Commission added seven utility criteria which evaluative information must attain. They are relevance, significance, scope, credibility, timeliness, pervasiveness, and efficiency. The Commission has tried to provide an evaluation theory and methodology which is scientifically respectable and is of utility to practitioners.

GENERAL SYSTEMS THEORY AND A SYSTEMS ANALYTIC MODEL

Since the framework of systems analysis can be traced back to General Systems Theory (Bertalanffy, 1968), certain tenets of this theory are reviewed to provide a foundation for building a systems analytic model for curriculum or program evaluation. This review begins with a definition of "system": "A system is a set of objects together with relationships between the objects and between their attributes (Hall and Fagen, 1968, p. 81).

The objects are the components of the system. In an educational system, the components or the objects would

include: students, teachers, administrators, instructional materials and media, buildings, etc. The attributes are the characteristics of the objects in the system. Thus a student (object) can be characterized in terms of his attributes (interests, I.Q., socio-economic status, and the like) while the instructional materials presented to him may be characterized in terms of their attributes (level of difficulty, type of media required, length of study time and so on). The relationships between the attributes of the various objects within a system tie that system into a functioning whole which is characterized by a distinct organization.

Implicit in the definition of system is the notion that "...a system has properties, functions, or purposes distinct from its objects, relationships, and attributes" (Hall and Fagen, 1968, p. 81). For example, two school districts could conceivably organize instructional programs to serve entirely different ends. While the objects (i.e., the pupils), their attributes, and the relationships might be essentially identical, the goals of the programs could be distinctly different.

For curriculum or program evaluation, the central "objects" of the educational system are the student and the curriculum. This system shall be called the "central subsystem." However, both the teachers and, less directly, the administrator also affect the student's

behavior and attitudes; therefore, teachers and administrators can be considered the environment for the central subsystem and, more specifically, can be considered subsystems. "Objects belonging to one subsystem may well be considered as part of the environment of another subsystem. Consideration of a subsystem, of course, entails a new set of relationships in general. The behavior of the subsystem might not be completely analogous with that of the original system. Some authors refer to the property "hierarchial order of systems"; this is simply the idea expressed above regarding the partition of systems into subsystems (Hall and Fagen, 1968, p. 84).

In general, an "instructional system" would be comprised of three subsystems: the central subsystem, the reference subsystem, and the support subsystem. The central subsystem in curriculum or program evaluation would consist of the students and the curriculum. The reference subsystem (e.g., the teacher) interacts directly with the central subsystem, and thus exerts the greatest influence on the central subsystem of any environmental factor. The support subsystem (e.g., administrators, school board) exerts an indirect influence on the central subsystem by directly influencing the reference subsystem, thus creating hierarchical relationships. In order to explain the way in which this hierarchical relationship operates, the additional concepts of open system, feedback, and centralization are introduced.

The key to understanding an open system is the concept of equifinality. The open system maintains balance by the assimilation of new conditions rather than having to return to its beginning state to achieve equilibrium. This concept can be illustrated when one considers a living organism as characteristic of an open system; balance is achieved as the organism adapts to changing conditions in the environment although the initial state of the organism never occurs again. The open system, then, tends to increase its complexity and order while still achieving equilibrium. In an open system, feedback mechanisms exist which enable the system to change continuously during evaluation. The description of an open system most clearly relates to the formative evaluation of curriculum or program improvement.

"A centralized system is one in which one element or subsystem plays a major role in the operation of the system" (Hall and Fagen, 1968, p. 86). With reference to an educational program, the student may be considered as the central subsystem. With reference to evaluation of a curriculum, the curriculum itself would be considered central along with the student.

To summarize the elements of General Systems Theory which have implication for the evaluation model to be developed, the following should be noted:

1. The system will be an open system which utilizes

feedback to insure the continued improvement of conditions which will tend to maximize the intended outcomes.

2. The system will be centralized in that one subsystem will play a major role with other subsystems interacting or supporting the elements of the major subsystem.

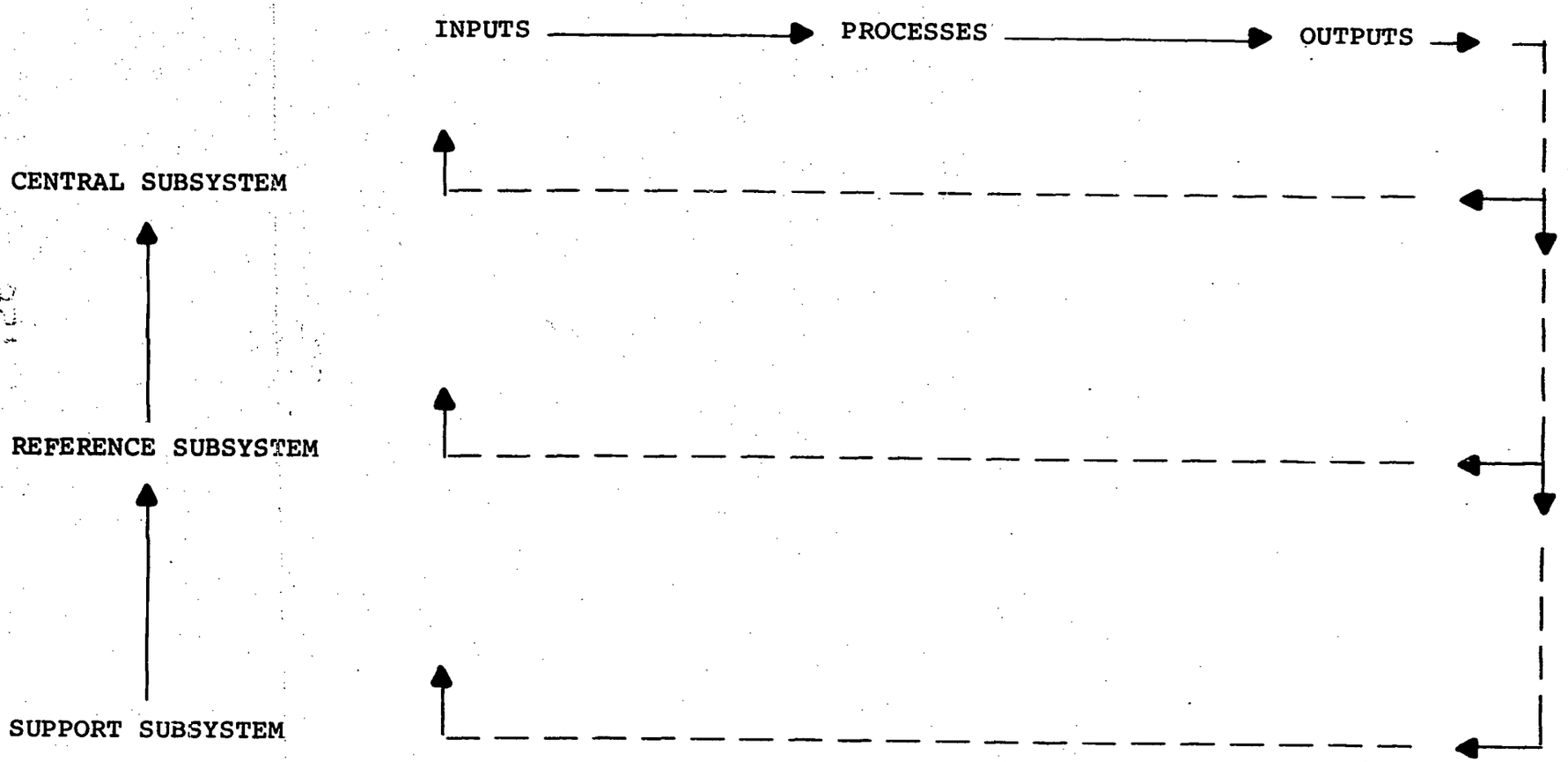
FRAMEWORK FOR A SYSTEMS ANALYTIC MODEL

The Skeletal Model

A system comprises the "processes" through which any person (or thing) entering must pass and exit when outcomes have been achieved. Thus a systems analytic model requires identification of inputs, processes, and outputs for each of the three subsystems--central, reference, support. These elements provide the basis for the model shown in Figure 1. The solid arrows show the direction of relationships between flow through the subsystems and flow between subsystems. The broken lines show the feedback throughout the entire system.

This skeletal model suggests analytic procedures for an evaluation program. The first procedure is to determine precisely what is to enter the system at all levels. If a curriculum is being evaluated with certain students, both the curriculum and the students must be described in full. In addition, the model indicates that the teachers (reference subsystem) and administrators

Fig. 1. Skeleton View of a Systems Analytic Model



(support subsystem) must be considered as part of the entire evaluation program. Given the inputs to the system, the processes through which the inputs pass must be identified specifically. The output section makes explicit every type of outcome to be realized by the system. For education, specification of output in terms of performance criteria is necessary but not sufficient. Any behavior, measurable or not, should be indicated if considered relevant.

Levels of Decision-Making

Evaluation, thus far, has been presented as the process of defining, obtaining, and using information to judge decision alternatives. A system has been described as a set of objects and the relationships among the objects and their attributes; a system has been characterized as an open system with feedback comprised of central, reference, and support subsystems with inputs, processes, and outputs specified for each subsystem. It is now necessary to introduce a further consideration--levels of decision making within an evaluative framework.

When constructing an evaluation plan or implementing an evaluation system, it is important to determine the different sources and perspectives from which evaluative questions arise and for which answers must be provided to facilitate the decision-making process. In asking the question "From whose point of view is evaluative data

collected?" Forehand (1968) distinguishes between two kinds of evaluation--project evaluation and institutional evaluation. This distinction is useful and necessary when one considers the evaluation needs within a complex organization.

The primary difference between project and institutional evaluation, in Forehand's terms, is that the institution considers the achievement of any particular program as a sub-set in relation to the network of other programs and other goals within the institution. Therefore, the perspective of the institutional evaluator will be quite different from that of the program or the project evaluator. The project evaluator would be primarily interested in improving output of a single unit within the institution.

The distinction between the perspective of a project evaluator and an institutional evaluator leads to the necessity for different types of data collection and reporting. A project evaluator, for example, is primarily concerned with formative evaluation; consequently, he will generally need micro data in answer to very specific questions which will facilitate the improvement of programs. The institutional evaluator, on the other hand, deals with a multitude of programs; his needs call for more generalized or macro data to be used in assessing the progress of the entire institution in meeting its goals. At times,

evaluative personnel at both levels will require both macro and micro data. In brief, the level of perspective or decision making will have an important influence on the subsystems. Examples provided later in the article will illustrate this point.

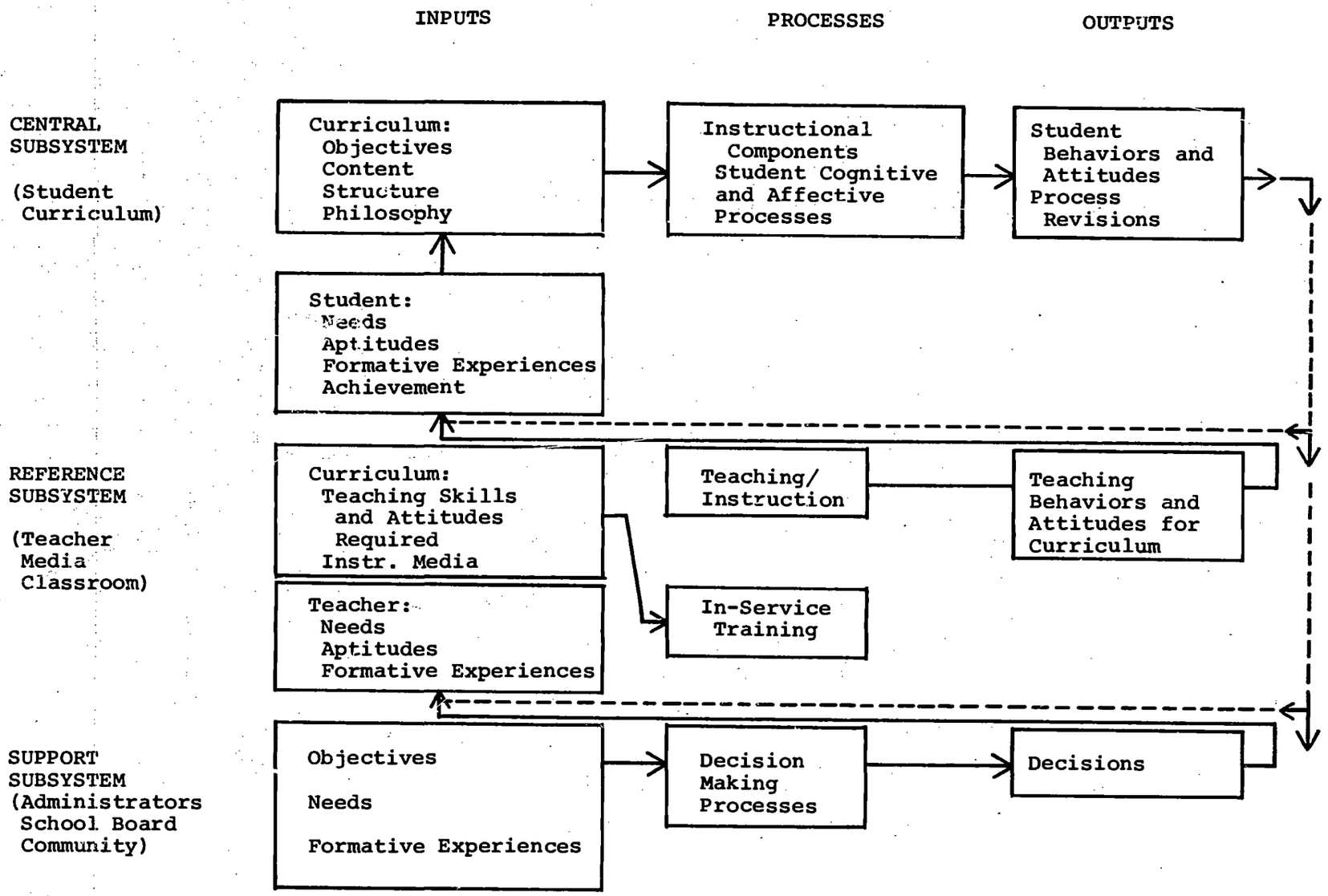
The Generalized Model

Figure 2 is an expanded version of the skeletal model previously presented. The general type of information for each subsystem has been identified along with the flow of data through the system. This figure also indicates that pupil outcomes will generally be of prime concern in most evaluation studies.

For the central subsystem, the background, aptitudes, and needs of the students in the evaluation need to be considered in setting the objectives for the evaluative program. Furthermore, the content, philosophy, and structure (i.e., attributes) of the curriculum being introduced need to be specified.

The inputs for the reference subsystem are concentrated on the experiences and aptitudes of the teachers and the types of instructional strategies required by the curriculum. The processes for the reference system are, first of all, the component acts of teaching. The consequent behaviors, skills, abilities, and attitudes of the teachers represent the output of the reference subsystem. This output serves as an input into the central subsystem.

Fig. 2. Systems Model for Program Evaluation



Finally, the experiences, abilities, attitudes, needs, and objectives of each of the components of the support system need to be identified. Support personnel, facilities, and funding play an important, though indirect, role in producing the outcomes desired. The primary responsibility of administrators and board members in a local school district is to make decisions affecting the curriculum, the students, and the teachers. The outputs of the support subsystem, in this case, decisions, influence the central subsystem by inputting into the reference subsystem.

APPLICATION OF THE MODEL TO A SPECIFIC PROBLEM

To illustrate this process of developing an evaluation system, the Eastern Regional Institute for Education (ERIE), a regional laboratory, is used as an example.

An Evaluation System for the Eastern Regional Institute for Education

Briefly stated, the mission of ERIE is to improve process-oriented education in the elementary schools of the nation. Process education provides more effective curricula in such areas as reading, mathematics, science, and social studies. A command of basic skills, the development of thinking ability, and the tools to continue life-long learning are important outcomes of process education.

To illustrate the development of an evaluation system for ERIE, three different levels of decision making within

or related to the mission of ERIE have been identified. These levels are termed: program level, institutional leadership level, and extra-institutional level.

The program level of operation within ERIE's structure is charged with the responsibility of testing process-promoting curricula in "laboratory-type" schools, adding needed elements such as adequate objectives and pupil assessment devices, and verifying that each curriculum produces its intended results. Being satisfied with results in a "laboratory-type" school, ERIE then installs each curriculum in a network of demonstration schools of diverse characteristics. When installing a new curriculum in demonstration schools, ERIE will study factors which facilitate or impede the successful implementation of the curricula.

The institutional leadership level of the organization is comprised of the executive officers of the Institute and the Board of Trustees; the latter group is the policy-making body.

Related to the effective operation of ERIE are groups which guide, support, and collaborate with the Institute in its efforts to improve process-oriented education. The U. S. Office of Education, and affiliates, comprise what will be termed, for the purposes of evaluation, the extra-institutional level of decision making. The U. S. Office of Education, through its Division of Educational

Laboratories, reviews and evaluates the general operation of the Institute and provides the major source of funding. The affiliates include the state departments of education, teacher training institutions, and local school districts within the region which collaborate with ERIE and support its work.

The distinctions made among the three levels (program, institutional leadership, extra-institutional) are critical for evaluation purposes; each group brings a different perspective from which to view the efforts of the Institute. These different perspectives determine the kinds of questions which each group asks, the type of information sought, and most importantly, the types of decisions which each group will make.

Before proceeding to give an example which would illustrate the application of the evaluation system to a specific ERIE program, it is of the utmost importance to recognize that with respect to the information to be gathered and the decisions to be made, the designation of central subsystem will change depending upon the questions being asked, by whom, at what level of perspective and decision making within or related to the Institute. Depending upon the answers to these questions, the central subsystem might be any one of the following: teachers, administrators, college professors, program components, or the Institute itself.

In Table 1, an example is provided in which the major components of the central subsystem are the student and the curriculum materials and the questions center on the extent to which the students achieve the cognitive and affective outcomes of the elementary school program, Science--A Process Approach. The components of the reference subsystem, in this case, would be the teachers and the classroom environment; the criteria for selecting these components require that they directly interact with the students in the learning process to produce the intended outcomes. The components of the support subsystem would include other physical facilities and support personnel, the administrative support with the school, financial support, and the consultant services provided by ERIE through the Regional Action Network (RAN) of college professors. The criteria for identifying the components for the support subsystem require that they directly interact with the components of the reference subsystem and indirectly affect the central subsystem components.

As illustrated in Table 2, teachers may be considered the central subsystem when considering questions about teacher effectiveness or teacher training in the evaluation of Science--A Process Approach. In this case, the reference subsystem would be the Regional Action Network of professor-consultants designated by ERIE to conduct the continuing inservice training of teachers. The support

TABLE 1

APPLICATION OF ERIE'S EVALUATION SYSTEM WITH PUPILS AS CENTRAL SUBSYSTEM

SUBSYSTEMS	INPUTS	PROCESSES	OUTPUTS
CENTRAL	-1-	-2-	-3-
Pupil	Biographical Information Educational Achievement Interests, Attitudes	Interaction between pupils and materials	Pupil attainment of specific outcomes Pupil attitudes toward subject and toward interaction
Materials	Description of materials Objectives, procedures, instruments, etc.		Efficacy of materials in producing pupil outcomes
REFERENCE	-4-	-5-	-6-
Teachers	Biographical Information Attitudes toward school environment, pupils, materials Knowledge of content of programs	Interaction with pupils materials in implementing program	Knowledge of content of lesson or lesson sequences Instructional skills required by lesson Attitude toward subject, pupils and interaction Effective use of materials with students
SUPPORT	-7-	-8-	-9-
Learning Environment	Description of learning environment	Interaction of pupil and teachers with environmental conditions	Adequacy of environment
Support Personnel	Description of Administrative and consulting personnel	Interaction of support personnel with teachers to promote program outcomes	Efficacy of interaction in producing outcomes
Plans	Description of plans for orienting or training teachers	Implementation of plans for orienting/ training teachers	Efficacy of orientation or training programs
Financial	Description of financial support for all levels of program	Implementation of plans with respect to financial support	Adequacy of financial support with respect to intended outcomes

TABLE 2

APPLICATION OF ERIE'S EVALUATION SYSTEM WITH TEACHERS AS CENTRAL SUBSYSTEM

Pupils as Central Subsystem (Table I)

SUBSYSTEMS	INPUTS	PROCESSES	OUTPUTS
CENTRAL Teacher	-1- Biographical Information Attitudes toward school environment, pupils, materials Knowledge of content of program	-2- Interactive behavior with pupils and materials	-3- Knowledge of content of lessons Instructional skills required by lessons Attitude toward content of lessons Attitude toward subject, pupil, and interaction Effective use of materials with student
REFERENCE RAN Professor	-4- Biographical Information Attitudes toward program and role of consultant Knowledge of program	-5- Interactive behavior of RAN professor with teacher as continuation of inservice training	-6- Effectiveness of interaction with teacher in producing desired teacher outcomes
SUPPORT	-7- Goals and Plans Financial Support Logistical Support	-8- Implementation of plans for orienting and training teachers and RAN professors Interaction of ERIE assigned personnel with teachers and professors Implementation of training plans with respect to financial and logistics support	-9- Effectiveness of ERIE training, at its termination, in terms of knowledge and behavior outcomes for teachers and RAN professors Effectiveness of training program in terms of logistics and financial support

subsystem would include the facilities and resources designated by ERIE to conduct the workshops for the training of consultants and teachers. In this case, the output of central interest includes the understandings, behaviors, and attitudes produced in teachers as a result of the training program.

A Note of Caution

In closing, several general comments regarding the application of a systems analytic model to educational evaluation are in order. First, it should be clearly understood that the systems analytic model presented is, at best, a heuristic device for program or curriculum evaluation; the data obtained from educational and psychological measurement is neither sufficiently precise nor sufficiently complete to permit building a predictive model for selection among decision alternatives. This means that in the development of this model, relationships, objects, attributes, and goals are not necessarily quantifiable--given the present state-of-the-art of educational and psychological measurement. Thus, the model encourages the evaluator to consider all relevant information for decision making, regardless of whether it can be reduced to a specific quantity. Secondly, this is an "empirical" model. This means that it attempts to describe the real world as it exists. The first

consequence of this is that the model is applicable to many different problems.

In the final analysis, the question remains: "What will systems analysis do for us?" The answer is that systems analysis will enable the evaluator to do a more comprehensive job of planning his evaluation effort. Systems analysis applied to educational evaluation is a heuristic device for organizing the problem in terms of its components and its relationships. As such, it reduces the possibility of omitting the collection of important information, and it forces the evaluator to consider all levels of information required of the evaluation program. Finally, it demands that the evaluation design make explicit what will be gained from the evaluation, and it assures that relevant information will be provided to decision makers. Once an evaluation plan is organized, the question of measurement arises. Systems analysis makes explicit the nature of the data to be collected but systems analysis does not tell the evaluator how to measure the educational outcomes specified; decisions related to instrumentation are beyond the scope of this presentation. By using this approach, the evaluator can be fairly sure that he has identified what to measure in order to provide information for the various levels of decision making.

This paper is a condensation of Program Report #103 and is available in limited supply at ERIE, 635 James Street, Syracuse, New York 13203.

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VARIABLES AFFECTING INSTALLATION

Richard S. Andrulis

Recent observations have indicated a period of extensive educational changes. Brickell (1961) reported on numerous changes in educational programs in New York State. Noting that good intentions alone do not assure improvement, Goodlad (1969) stated that "much of the so-called educational reform movement has been blunted on the classroom door [p.59]." Stufflebeam (1966) described 150 innovations that were adopted in Ohio schools.

Through research on educational change and innovation, a formidable body of findings has been compiled. Ross (1958) found that money expended on teachers and classrooms was the strongest factor influencing the adoption of innovations. Furthermore, Carlson (1965) indicated that social characteristics, relationships, and the communication behaviors of a school's staff were related to the innovativeness of a school system. He cited observations that the principal has a significant role in the rate of adoption of new educational programs. Bhola (1965) emphasized the importance of the physical, social, and intellectual environments involved in the installation of new curricula. Other studies by Griffiths (1968) and Pellegrin (1966) stress the importance of external sources in bringing about

educational changes.

Even with the rate of innovation as high as it has been, relatively few research studies have attempted to study the variables affecting the degree of success attained in the installation of a new curriculum program. A recent report by Gross, Giacquinta, and Bernstein (1968) states that

> ...the assumption is frequently made that an adopted innovation is being properly implemented when outcomes are measured. If no effect is found, its ineffectiveness is typically ascribed to either inadequateness in the innovation itself, or to a premature evaluation. Yet, it is quite possible that the innovation is having little, if any, effect for another reason: its actual implementation has been minimal [p.3].

The Present Study

The purpose of the present investigation was to determine what school characteristics might influence the success of a curriculum installation. Once the impact of these variables is assessed, procedural prescriptions can be written and strategies can be formulated to maximize the successes of a change agent conducting curriculum installation in schools. This can only occur once the most important factors have been found to be reliable and valid.

The present investigation centered on the installation of Science--A Process Approach in elementary schools. The installation began in the fall of 1967 in 19 public schools in ERIE's geographic area. In the spring of 1968 a first

attempt at identifying factors which influenced installation revealed that certain demographic characteristics of teachers, principals, and schools were potentially important. The results were judged to be indicative but inconclusive of any particular pattern. The ERIE staff decided to re-examine these variables and add to the factors hypothesized to influence the success of installation. The major added factors were teachers' and principals' attitudes toward their schools and the personalities of these individuals. In summary, the present study attempted to relate a set of variables descriptive of the teachers, principals, and schools plus attitudinal and personality factors which are certain indicators of the degree of installation success of the curriculum program.

Research Questions

The present investigation posed a set of research questions to be examined:

1. Which demographic characteristics might discriminate between schools which were successful and schools which were unsuccessful installers of the Science--A Process Approach curriculum?
2. What is the relationship between teachers' perception of school morale, school climate, selected personality variables and the success of the installation?
3. What differences exist between two groups of

teachers, those using and not using the innovative curriculum program with respect to selected personality variables, and perceptions of school morale and school climate?

4. What relationships exist among the perceptions and attitudes of the teachers, principals and consultants with respect to school morale and climate?

Among the demographic variables used in this study are the following:

1. Amount of financial aid per child.
2. Age of principal and years in that school.
3. Percent of district students going beyond high school.
4. Occupational categories of fathers as rated by teachers, etc.

Methodology - Instruments

To achieve measures of school morale, perceptions of school climate, and of personality, the following instruments were selected after careful search: The Purdue Teacher Opinionaire, the Organizational Climate Inventory, and the Activities Index.

The PURDUE TEACHER OPINIONAIRE used to measure the attitude of the teachers toward school morale was developed by R. Bentley and A. Rempel. It includes the following factors:

Factor 1 - Teacher Rapport with Principal

Factor 2 - Satisfaction with Teaching

Factor 3 - Rapport Among Teachers

Factor 4 - Teacher Salary

Factor 5 - Teacher Load

Factor 6 - Curriculum Issues

Factor 7 - Teacher Status

Factor 8 - Community Support of Education

Factor 9 - School Facilities and Services

Factor 10- Community Pressures

The instrument used to assess the perceptions of the school climate by the teachers was the ORGANIZATIONAL CLIMATE INVENTORY. Developed by George Stern, this assessment device postulated the concept of organizational climate as comprised of the following:

Developmental Press This is defined as the capacity of the organization to support, satisfy, or reward self-actualizing behavior. Developmental Press subsumes the following:

1. Intellectual Climate
2. Achievement Standards
3. Practicalness
4. Supportiveness
5. Orderliness

Control Press This is circumscribed to include a reflection of factors 1 and 2 above. In addition, Control

Press involves a treatment of:

6. Impulse Control

The third instrument included in this battery was also developed by George Stern. It is entitled the ACTIVITIES INDEX. As a measure of personality traits, it includes 12 first order and 5 second order factors. The variables measured are as follows:

Achievement Orientation This second order factor includes five first order factors which indicate that high scores mean strong ego striving and low scores mean indifference to personal achievement. The first order factors are as follows:

1. Self-Assertion
2. Audacity-Timidity
3. Intellectual Interests
4. Motivation
5. Applied Interests

Dependency Needs A high score on this second order factor indicates a generally high level of dependent, submissive and socially controlled behavior. A low score represents autonomy, ascendance and non-conformity.

6. Constraint-Expressiveness
7. Diffidence-Egoism
8. Orderliness
9. Submissiveness
10. Timidity-Audacity
11. Closeness

Emotional Expression The stress is placed on high levels of social participation and emotional spontaneity.

12. Closeness
13. Sensuousness
14. Friendliness
15. Expressiveness-Constraint
16. Egoism-Diffidence
17. Self-Assertion

Educability Reflects interest in academic activities coupled with orderliness and conformity; high scores indicate that people are not likely to be creative or original but more likely to accept directions.

18-22. The factor loadings on this dimension, which have been discussed before, are intellectual interests, motivation, applied interests, orderliness, and submissiveness.

Honors Scale Honors criterion score has been developed from the Activities Index to differentiate students from the highly selective independent liberal arts colleges from those attending other schools. The score is based on tendencies toward a higher level of achievement orientation, low dependency needs, and a low level of sociability and emotionality.

Methodology - Population

Within the 21 elementary schools used in this study, 306 classroom teachers were trained by ERIE to teach

Science--A Process Approach in kindergarten through fourth grade. The total number of classroom teachers in these pilot schools was 469. Due to the diversity of sites the number of teachers using Science--A Process Approach in a pilot school ranged from 4-26 with a mean of 14. Also included in this population were 23 principals and 7 consultants from ERIE serving the schools.

During the spring of 1969, the 306 teachers and 23 principals were administered the Purdue Teacher Opinionaire, the Organizational Climate Inventory and the Activities Index. However, when the principals were administered the Purdue Teacher Opinionaire, they were instructed to react to the inventory as they perceived their teachers would.

Methodology - Criteria

There were three sets of criterion variables used for assessing the degree of successful installation of Science--A Process Approach. The first was the program director's rankings of the 21 schools according to the following dimensions:

1. The instructional progress of the school as measured by the amount of lessons taught by all the teachers in a school during the 1968-1969 academic year.
2. The amount of resistance received from the school; that is, the degree of opposition in either oral communication or in writing to the program director

or the consultants by the teachers and/or principal toward teaching the Science--A Process Approach program.

3. The independence of the school: the capability of the schools' principals and teachers in solving local problems of, for example, equipment usage and maintenance, without calling on ERIE.

A final ranking was then determined on the basis of these three criteria cited above, by weighing the three factors three, two, and one, respectively, and then ranking the schools according to their composite score.

The other dependent variables used to measure the degree of successful installation were (1) the actual number of science exercises from the curriculum which each teacher taught during the academic year and (2) the average pupil proficiency on competency test items administered by the teachers at the end of each exercise. Both types of data items were obtained through the teachers' filing with ERIE a mark sense card that indicated the grade level being taught, the exercise identity, the week completed, and the pupils' responses to a range of AAAS developed competency items.

Methodology - Procedure

The procedures used for the statistical analysis of the data were to first determine the means and standard deviations on all independent and dependent variables.

When possible, demographic data were compiled as percentages or as discrete categories.

Pearson product moment correlation coefficients were then determined for the relation of each dependent variable to the several independent variables. In the case where one score was given for a school or a principal, this score was duplicated for as many teachers as there may be in the school, when individual teachers' attitudes or personality characteristics were correlated with it. Finally, t tests were run between groups of teachers classified into the highest, middle, and lowest criterion groups. The criterion groups were computed by selecting the highest 27 percent of the teachers on the two criteria of number of lessons taught and average pupil proficiency on the competency items; the middle 46 percent of teachers were then selected and finally, the bottom 27 percent of the teachers. Ratios on t tests were then computed on the basis of attitudinal and personality characteristics and on demographic characteristics to ascertain the degree of importance of a particular variable in discriminating between each two criterion groups. The final t tests were then run between the group of teachers using the Science--A Process Approach curriculum and the group of teachers not using the curriculum; the bases for these comparisons were on the personality and attitudinal factors obtained from all teachers during the spring of 1969.

Results

The findings of the investigation clearly indicate the relationship between certain demographic factors and the degree of successful installation of the science curriculum, Science--A Process Approach. The following demographic characteristics were found to be significantly related to the criteria of the program director's rankings, to the number of lessons taught and to average pupil proficiency on competency items: expenditure per pupil; socio-economic status of parents; percentage of high school students in the school district attending junior and senior colleges; number of years a principal has been in a school; percentage of Roman Catholics in the school; and provisions for exceptional students. The results point to the successful school as existing in a low to moderate income area, with a high percentage of semi-skilled, first generation Americans of southern or eastern European heritage. (See Table 1.) The successful school tends to grant a long tenure to the principal who supervises rather young teachers. The school maintains an organized procedure for the placement of both average and exceptional students into appropriate classrooms. Conversely, the more unsuccessful school is found in a moderate to high income area, where students and schools are financially well off. The school exists in a more traditional suburban or urban area, rather than a rural or mining environment.

TABLE 1

Means, standard deviations and Pearson Product Moment Coefficients of Correlation of school and teacher demographic data with the criteria of the program director's rankings, the criteria of number of lessons taught by each teacher, and all students average percent acceptable scores obtained for each teacher on Science--A Process Approach competency items during the 1968-1969 academic year.

			CRITERIA OF INSTALLATION SUCCESS					
			Program Director's Ranking				Teacher's Data	
Means	SD	Demographic Variables	Composite Ranking	Instructional Progress	Resistance	Inde-pendence	Number of Science Lessons Taught	Average Percentage Acceptable Scores on Competency Items
29.7	15.9	Father's Occupation: Percent Professional Positions	-.55*[1]	-.47	-.59	-.45	-.17*[2]	
16.5	6.0	Father's Occupation: Percent Managerial Positions			-.50		-.12	
36.8	12.3	Father's Occupation: Percent Semi-Skilled Positions	.52	.43	.57	.45	.16	
16.4	3.5	Teacher Evaluation of Classroom Facilities			.41			
33.6	24.8	Percent of Teachers with Over Ten Years Teaching Experience				-.49	-.17	
41.4	7.3	Principal's Age						.13
6.1	3.8	Principal: Years in Present Position						.14
5.2	3.9	Principal: Years in This School		.44			.22	.11
1.5	0.5	School's Provision for Accelerated Curriculum		.42*[1]		.42	.16*[2]	
1.7	0.9	School's Provision for Special Instruction Programs - Large Scale Innovative Program					.13	
1.7	0.5	School's Provision for Special Instruction Program - Program Instruction						-.11
793.6	178.8	Total Fiscal Expenditure Per Pupil	-.57*[1]	.45	-.64	-.54	-.23	
443.7	125.4	Fiscal Expenditure for Instruction			-.48		-.19	
9.1	5.7	Size of District		.42			-.13	
47.3	17.6	Percent of Students Going to College	-.53	-.49	-.58		-.21	
36.6	15.9	Percent of Catholic Students in School District					.14	.18
4.3	9.3	Percent of Jewish Students in Schools					-.13	
58.7	17.9	Percent of Protestant Students in School District						-.15

*[1] For program director's ranking r=.42 p<.05 df 20

*[2] For teacher's data r=.11 p<.05 df 300

TABLE 1 (cont'd)

Means	SD	Demographic Variables	CRITERIA OF INSTALLATION SUCCESS: Program Director's Ranking: Composite Ranking	Program Director's Ranking: Instructional Progress	Program Director's Ranking: Resistance	Program Director's Ranking: Independence	Teacher's Data: Number of Science Lessons Taught	Teacher's Data: Average Percentage Acceptable Scores on Competency Items
87.8	8.3	Percent of Teachers Choosing Teaching as A Career						-.15
1.3	0.4	School's Use of Achievement Scores Assigning Pupils Class	.48*[1]		.53	.40	.19*[2]	.12
1.2	0.4	School Use of Age to Assign Pupils to Class	.46		.46	.44	.18	
1.4	0.5	School Basis for Assigning: Pupil's Judgment of Teachers or Principal						-.14
1.2	0.4	School Basis for Assigning Pupil's School Marks					.14	
1.3	0.5	School Problem as Evaluated by the Principals: Community Interest					-.19	
1.2	0.4	School Problem as Evaluated by the Principal: Poor School Appearance			.48		.15	
1.2	0.4	School's Method of Reporting Separate Grades for Achievement and Aptitude		-.47*[1]			-.17*[2]	
55.2	10.6	School District Change in Active School Enrollment						.13
1.5	0.5	Obstacles to Educational Improvement as Evaluated by Principal: Teacher Related Problems	-.46		-.59	-.53	-.5	
1.3	0.5	Obstacles to Educational Improvement as Evaluated by the Principal: Community Problems				.47		
1.7	0.5	Material Obstacles to Educational Improvement as Evaluated by Principal: Teacher Facilities	-.75	-.64	-.85	-.51	-.36	
1.2	0.4	Material Obstacles to Educational Improvement as Evaluated by Principal: Shortage of Funds					-.36	
1.1	6.3	No School Problems					.21	
4.4	2.9	Number In-School and District Workshops Attended by Teachers						.19

*[1] For program director's ranking r=.42 p<.05 df 20

*[2] For teacher's data r=.11 p<.05 df 300

The degree of satisfaction of teachers with factors constituting school morale, the perceptions of school climate and selected personality traits of teachers were found also to be related to the success of the installation of Science--A Process Approach. Teachers who are dissatisfied with their salaries, perceive their environment as being overly achievement-oriented with an emphasis on intellectual activities, perceive their environment as rewarding self-starting behavior, that employ persons with aggressiveness in their inter-personal relationships and who are emotionally expressive and spontaneous are among the group found to be the least successful of all teachers using the Science--A Process Approach program (See Table 2). On the other hand, teachers who are satisfied with school physical facilities, who are orderly and structured in setting and meeting goals for their students, and who are highly dependent upon others, and perceive their school's environment as controlled and restricted in its daily activities are among the group of teachers highly successful in the installation as assessed by the criteria of the program director's ranking and the variables of number of exercises taught and average pupil proficiency on competency items.

Among the more interesting aspects of the study were the research questions asking about possible differences between teachers using the curriculum innovation and those

TABLE 2

Means, standard deviations and Pearson Product Moment Coefficient of Correlation of scores on the Purdue Teacher Opinionaire, Organizational Climate Index (OCI), and Activities Index (AI) with the criteria of the director's rankings, and the criteria of the number of lessons taught by each teacher and all students average acceptable scores obtained for each teacher on Science--A Process Approach items during the 1968-1969 academic year.

			CRITERIA OF INSTALLATION SUCCESS					
			Program Director's Ranking				Teacher's Data	
Means	SD	Attitude/ Personality Variables	Composite Ranking	Instructional Progress	Resistance	Inde-pendence	Number of Science Lessons Taught	Average Percentage Acceptable Scores on Competency Items
21.5	4.4	Purdue..Teacher Salary	-.12*[1]		-.20			
15.4	3.3	Purdue..Currirulum Issues					.13*[2]	
15.3	3.3	Purdue.School Facilities				.13	.16	
13.0	7.0	AI..Self Assertion	-.15	-.13	-.16	-.11		
20.5	6.4	AI..Orderliness	.15	.14	.16		.13	
13.5	4.5	AI..Sensuousness	-.15		-.22			
17.3	6.3	AI..Expressiveness Constraint	-.16	-.13	-.21			
8.6	3.8	AI..Egoism			-.11			
155.7	19.8	AI..Dependency Needs	.12	.11	.14		.14	
89.8	22.5	AI..Emotional Expres-siveness	-.15		-.21			
156.4	22.3	AI..Honor Scales					-.14	
52.6	13.9	OCI..Intellectual Climate	-.19	-.16	-.22			.13
31.2	6.9	OCI..Achievement Standards	-.14	-.14	-.15			
32.6	7.0	OCI..Impulse Control	.25	.19	.32	.13		
192.1	31.2	OCI..Development Press	-.12	-.11	-.15			
88.8	24.4	OCI..Control Press	-.21	.18	.26	.11		

*[1] For program director's ranking r=.42 p<.05 df 20

*[2] For teacher's data r=.11 p<.05 df 300

not using the innovation. Results from the study indicate that the group of 286 Science--A Process Approach teachers (grades K-4) and approximately 185 non-Science--A Process Approach teachers within the same school (grades 5 and 6 and some K-4) indicate practically no differences in their perceptions of the school climate and school morale. For the two instruments of the Organizational Climate Index and the Purdue Teacher Opinionaire, the only significant differences indicated that the Science--A Process Approach teachers as a total group are more satisfied with their salaries, with the curriculum programs they are using, and their status and prestige in the community than the group of non-Science--A Process Approach teachers (See Table 3). The major differences occur on the scores obtained from the Activities Index. The non-Science--A Process Approach teachers as a group were found to be more self-assertive, aggressive in their inter-personal relationships; these non-Science--A Process Approach teachers tend to be more intellectually active and concerned about the science as well as the humanities, but they demand tangible and concrete results implied by such intellectual activities. The non-Science--A Process Approach teachers tend to be egocentered and over confident, with a higher need to achieve.

Another set of results treats the relationships between (1) the principals and teachers, and (2) consultants and teachers on factors constituting the concept of

TABLE 3

Means, standard deviations and values for Science--A Process Approach vs. non-Science--A Process Approach teachers on the three inventories of the Purdue Teacher Opinionaire, the Activities Index, and the Organizational Climate Inventory.

PURDUE TEACHER OPINIONAIRE (Science N=286, Non-Science N=164)

Variable	SAPA Means	SAPA SD	Non-SAPA Means	Non-SAPA SD	t
Teacher Rapport with Principal	66.7	12.0	64.9	12.8	1.46
Satisfaction with Teaching	70.1	8.4	68.6	8.4	1.85
Rapport Among Teachers	46.6	7.0	45.2	7.3	1.47
Teacher Salary	21.5	4.4	20.6	4.6	1.96*
Teacher Load	36.4	5.1	36.1	5.4	.53
Curriculum Issues	15.4	3.3	14.6	3.4	2.48*
Teacher Status	25.2	5.0	24.2	4.7	2.29*
Community Support	95.8	3.5	15.4	3.4	1.19
School Facilities and Services	15.3	3.3	14.7	3.9	1.76
Community Pressures	16.9	2.7	16.9	2.6	- .14
ACTIVITIES INDEX (Science N=286, Non-Science N=156)					
Self-assertion	13.0	2.0	15.0	7.6	-2.73*
Audacity - Timidity	12.8	5.6	14.4	5.7	-2.82*
Intellectual Interests	23.3	7.9	24.9	7.4	-2.17*
Motivation	23.4	6.5	24.2	6.0	-1.37
Applied Interests	15.4	5.7	16.9	6.1	-2.60*
Orderliness	20.5	6.4	21.4	6.8	-1.34
Submissiveness	23.0	5.4	23.5	4.8	.90
Sensuousness	25.4	5.3	25.3	5.4	-1.29
Friendliness	12.0	4.1	11.9	4.1	.29
Expressiveness - Constraint	17.3	6.3	17.5	7.1	- .27
Egoism - Diffidence	8.6	3.8	9.5	3.7	-2.40*
Achievement and Orientation	87.8	25.1	95.4	24.7	-3.07*
Dependence Needs	155.7	19.8	155.7	19.9	- .02
Emotional Expression	89.8	22.5	93.3	25.7	-1.47
Educability	105.5	21.7	110.9	20.8	-2.53*
Honors Scale	156.4	22.3	157.9	19.5	- .69
ORGANIZATIONAL CLIMATE INDEX (Science N=287, Non-Science N=162)					
Intellectual Climate	52.6	13.9	52.0	14.8	.42
Achievement Standards	31.2	6.9	30.1	7.5	1.65
Practicalness	12.5	2.5	12.4	2.5	.43
Supportiveness	63.3	11.0	62.5	12.5	.73
Orderliness	32.4	4.8	32.2	5.4	.40
Impulse Control	32.6	7.0	33.3	7.1	1.08
Development Press	192.1	31.2	189.2	36.8	.86
Control Press	88.8	24.4	91.2	25.1	1.02

*p<.05

school morale. These results (See Table 4) indicate that the principals do not perceive the same degree of satisfaction as teachers with respect to principal's rapport with teachers and the teacher's load for instruction as measured by the Purdue Teacher Opinionaire. However, the consultants serving the schools expressed the same perceptions in these dimensions as the teachers did. Conversely, the principals, on the whole, accurately indicated the teachers' satisfaction in the teaching, rapport among teachers, satisfaction with salary, curriculum status, community support, and school facilities. The consultant agreed with the teacher's degree of satisfaction on four of the seven variables with which the principal expressed agreement. These are rapport among teachers, curriculum issues, community support and school facilities.

Certain patterns in the results suggest a satisfactory level of reliability and validity of the criteria. For instance, the inter-relationships of the sets of criteria (See Table 5) provide evidence of validity for the results of the investigation. The results show that the program director's ranking of instructional progress (i.e. number of lessons taught in school) was significantly related to the teacher's report on the number of lessons she taught ($r=.45$, df 300, $P<.01$). The lack of perfect relationship is primarily due to the differences in measurement; the program director's ranking was for an entire school, while

TABLE 4

Pearson Product Moment Coefficient of Correlation between the teacher and principal and teacher and consultant on the Purdue Teacher Opinionaire.

PURDUE FACTOR	MEANS		STAND. DEV.		Correlation
Principal with Teacher	Prin.	Tea.	Prin.	Tea.	Values
Satisfaction with Teaching	66.3	70.1	12.3	8.4	.18*
Rapport Among Teachers	43.9	46.6	7.8	7.9	.20
Teacher Salary	20.4	21.5	4.5	4.4	.33
Curriculum Issues	14.8	15.4	3.9	3.3	.32
Teacher Status	23.5	25.2	5.4	5.0	.22
Community	16.3	15.8	1.8	3.5	.14
School Facilities	15.2	15.3	3.5	3.3	.21

	MEANS		STAND. DEV.		Correlation
Teacher With Consultant	Tea.	Cons.	Tea.	Cons.	Values
Teacher Rapport With Principal	66.7	63.2	12.0	11.4	.44
Rapport Among Teachers	46.6	48.4	7.9	5.3	.17
Teacher Load	36.4	34.7	5.1	4.4	.28
Curriculum Issues	15.4	16.3	3.3	2.5	.26
Community Support	15.8	16.6	3.5	3.4	.18
School Facilities	15.3	15.1	3.3	3.7	.40

*r=.11 p<.05 df 300

Note: No significant correlations appeared between consultants' and principals' responses on the Purdue Teacher Opinionaire.

TABLE 5

Pearson Product Moment Coefficient of Correlation among the criterion variables obtained from the program director's rankings and the criteria of the number of lessons taught by each teacher and the students average percent acceptable scores obtained for each teacher on Science--A Process Approach competency items during the 1968-1969 academic year. The variables are the director's composite ranking of successful installation, comprised of the instructional progress of the school, the degree of resistance, independence exhibited by the school, the teachers' reports of number of science exercises taught, and student proficiency on competency items.

			CRITERIA OF INSTALLATION SUCCESS				
			Program Director's Ranking				Teacher's Data
Means	SD	Criteria	Composite Ranking	Instructional Progress	Resistance	Independence	Number of Science Lessons Taught	Average Percentage Acceptable Scores on Competency Items
		Director's Ranking						
10.8	5.7	Composite Rank		.92*[1]	.92	.83	.45*[2]	
33.4	18.8	Instructional Progress			.77	.70	.45	
20.2	12.4	Resistance				.75	.41	
11.0	6.2	Independence					.32	
		Teacher's Data						
14.9	6.0	Number of Science Lessons Taught						.21
.8	.1	Average Percentage Acceptable Scores on Competency Items						

*[1] r=.42 p<.05 df 20

*[2] r=.11 p<.05 df 300

the teacher's data was reported for each individual. Additionally, the number of lessons taught by a teacher was significantly related to the average pupil's proficiency on the competency items ($r=.21$, df 300, $P<.01$).

It is still realized that the dependent variables used in this study are not perfect indices of the degree of successful installation of a curriculum program. In addition to a degree of unreliability inherent in each, none is a completely valid indicator of successful installation of a curriculum. One could argue over the substantive aspects of the criteria used in this study. It is apparent that criteria to judge the degree of successful installation should be expected to include a host of subjective and objective data as was used in this research investigation. However, one could also add such aspects as the school district's commitment to find and provide in-service training to replace teachers in the program, to provide for consultant services, to maintain, not replace, equipment, and to provide for local school district expansion as a further embellishment of the criteria. For the purposes of this study, the criteria of the program director's ranking and teacher data were judged to be a useful and fairly accurate measure of the degree of successful implementation of the Science--A Process Approach curriculum. Furthermore, it should be clearly understood that a myriad of possible conditions could more than

confound the results discussed so far. The fact that the director was the only person to rank the success of the school could influence the relationships of the attitudinal and personality factors with the measures of successful installation. Although using only the program director to rank the schools was an invitation to some unreliability, previous years' data obtained from the director and his assistant yielded near perfect inter-rater agreement. Furthermore, less qualified judges would tend to reduce validity since they would be less familiar with the installation effort. In addition, only subjective opinions were provided by the consultants to confirm the reliability of data gathered from the teachers. There were only infrequent checks on the teachers to ascertain whether or not they actually taught the specific exercises of the curriculum they stated they did. No checks, at all, were provided for assessing the pupils' proficiency on the competency items administered at the end of each exercise. The teachers selected students, gave the items, and returned the results. Individual changes in the questions asked, or changes in the acceptability of a response, were never known.

Discussion

The teacher's personality and attitudinal characteristics found to be related to the degree of success of the installation provide a partial picture of what a successful teacher looks like. Generally, the more verbal and

aggressive the teacher is in inter-personal realtionships, the higher the probability that this person will be unsuccessful with this process approach curriculum. The more successful teacher is characterized by being submissive to authority and dependent upon others to fulfill certain basic needs. One could say that certain personality characteristics need to be sought or cultivated in teachers to provide for more successful teaching.

One might speculate that teacher training institutions in the future might need to consider personality variables in their selection and education of teachers. Certain traits might require particular cultivation as certain curricular trends are anticipated.

Additional results on the differences between Science--A Process Approach teachers and non-Science--A Process Approach teachers indicate that the Activities Index instrument did discriminate between two groups. The non-Science--A Process Approach group of teachers turned out to be more aggressive, but intellectually active with a high interest in the tangible and concrete facts of reality. Furthermore, the non-Science--A Process Approach group was more egocentered and self assured. However, these personality differences coupled with some attitudinal differences might be explained by the grade and sex differences that exist between the two groups. The Science--A Process Approach

group is predominately comprised of female teachers (approximately 95%) in grades K-4 while the non-Science--A Process Approach group has a lower percentage of female teachers (approximately 80%) in grades 5 and 6.

Next to be discussed are the factors related to the teachers' and principals' attitudes toward school morale as measured by the Purdue Teacher Opinionaire. As previously indicated, teachers who are more aggressive, more independent, and less structured in their activities appear to be less satisfied with the factors constituting the concept of school morale. Conversely, principals who themselves are more orderly and structured in their activities are more dependent, are inclined to see their teachers as being more satisfied with the ten areas of school morale. These results were confirmed to a degree when the principal's Activities Index scores and Teacher Purdue scores were correlated. With an aggressive, ego-centered and emotionally spontaneous principal, teachers were less satisfied with their positions than those with principals showing less emotional expression and aggressiveness. Principals with certain personality traits of aggressiveness, intellectual interests, and dependency thought they supervised satisfied teachers, but in fact they supervised unsatisfied teachers.

Personality characteristics of teachers appear to be different from the traits of principals in their relationships to perceived school climate.

Teachers who are:	Perceive their environment as:
-Dependent and submissive	-Intellectually active
-Orderly and structured	-Supportive of member's activities
-Educationally tractable	-Orderly and structured into activities
Principals who are:	**Perceive their environment as:**
-Socially aggressive	-Geared to intellectual activities
-Oriented toward practical and tangible goals	-Practical
-Submissive to authority	-Supportive
-Aloof from the members of the environment	-Orderly
-Oriented to high achievement	
-Educationally tractable	

Thus there appears to be a notable difference between the personality patterns of teachers and principals in their perceptions of the school's climate.

The last set of results deals with the relationship of teachers' attitudinal and personality traits to the visiting consultants' perceptions of the satisfaction of the teachers. Teachers who are orderly and structured, stoical and reserved, are perceived by the consultants to be satisfied with their relationships with other teachers, the curriculum they teach, and the status the teachers feel they have in the community.

Educational Implication

Installation of a new curriculum must be regarded as a

complex and challenging task. It cannot be accomplished in a routine fashion by mere delivery of instructional kits and teachers' guides. Inservice preparation of teachers for an innovation must go well beyond the orientation stage if teaching behaviors and pupil learning are to be substantially improved.

The results of the study postulate certain personality and attitudinal characteristics associated with the degree of success of a teacher with a particular innovative curriculum program. Serious speculation might be raised about whether certain curriculum programs need particular types of teachers to use them effectively. For example, the Individually Prescribed Instruction program poses a philosophy of individual pacing for each child. Surely, the relations of the concepts of individuality, to pacing for pupil learning, to instructional methods, and finally to teacher personality characteristics are not without importance. Questions hav been raised about whether children with certain traits learn differently. Why not consider the hypothesis that teachers with certain traits might be better instructors with certain curricula? The question will remain for a number of years; this study attempted a look at what might affect successful teaching of a process-oriented elementary curriculum.

Predictions might be made on the basis of the school personnel characteristics and a particular curriculum to

determine the degree of success the school might expect to have with installing such a program. In fact, further investigation calls for the development of a set of regression equations based upon the teachers' and principals' attitudinal and personality data. The criteria of the number of lessons taught and average pupil proficiency will provide a measure of consistency from year to year. ERIE has expanded extensively from the initial 21 schools used in this study to well over 50. These provide more than enough subjects for a continuing investigation in addition to a cross-validation that might be carried out. This type of study may provide a set of weighted variables for use by a superintendent or principal attempting to ascertain the chances for success in the installation of a new curriculum program.

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