DOCUMENT RESUME

ED 181 555 EA 012 349

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TITLE Curriculum Analysis: An Aid to Selection, Adaptation and Implementation of Curricula.
INSTITUTION Pittsburgh Univ., Pa. Learning Research and Development Center.
SPONS AGENCY National Inst. of Education (DHEW), Washington, D.C. Dissemination and Resources Group.
PUB DATE Jul 77
CONTRACT 400-76-0094
NOTE 63p.; For a related document, see EA 012 348

EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS Curriculum Development; *Curriculum Evaluation; Educational Objectives; *Evaluation Methods; *Media Selection; Needs Assessment; *Program Evaluation; Student Motivation
IDENTIFIERS Cooley Lohnes Evaluation Model; *Curriculum Analysis; Linking Agents; Pennsylvania School Improvement Program; *Research and Development Utilization Program

ABSTRACT

This paper explains the use of intrinsic analysis procedures developed, as part of the Pennsylvania School Improvement Program (PSIP), to evaluate and choose curriculum materials and instructional programs. An intrinsic analysis, as distinct from an evaluation using outcome measures or classroom processes, employs research criteria to make decisions about the adequacy of curricular components. The intrinsic analysis looks at four elements of the Cooley-Lohnes Model for assessment of classroom practices: motivators, opportunity, structure, and instructional events. It also draws upon the Process Individualized Curriculum (PIC) model of curriculum design. When using this analysis of curriculum materials, the investigator first assesses whether the materials provide the conditions that research suggests are motivating to students. Second is an evaluation of the intensity of the cognitive activity provided. Analyzing structure involves examining structure, sequence, placement procedures, testing adequacy, and exemplary appropriateness. Finally, instructional strategies are analyzed for appropriateness, consistency, provision for higher level skills, and adequacy of teacher manuals. (Author/JM)

Curriculum Analysis: An Aid to Selection, Adaptation and Implementation of Curricula

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July, 1977

I. INTRODUCTION

The Pennsylvania School Improvement Program (PSIP) is working with schools to help them improve instruction in basic skills. Funded by the National Institute of Education, this program is one of seven projects designed to help schools identify their needs and select and install solutions to meet those needs, employing the knowledge, programs, and practices generated by the research and development community. This paper describes curriculum analysis, one of the procedures which will be used whenever it seems appropriate in the selection process.

The PSIP has established a network of agencies to work with schools in improving instruction. All of these agencies have long been engaged in educational administration, research, design, development, and implementation. Now they are linked in a concerted effort to improve Pennsylvania schools. Two of the agencies are research and development agencies: Research for Better Schools, an educational laboratory, and the Learning Research and Development Center, a university-based R&D Center. One agency is a dissemination agency: Research and Information Services for Education (RISE). The other two are state and regional education agencies: The Pennsylvania Department of Education and Intermediate Units. The PSIP currently is working with two Intermediate Units: Northwest Tri-County Intermediate Unit #5 and Colonial Northampton Intermediate Unit #20.

Most of the tasks involved in the identification of needs and of potential programs and practices to meet those needs use procedures which are not uncommon in the education field. While the specific tasks undertaken by the local action team, in the PSIP needs and program analyses and solution screening and selection processes, may vary slightly from school to school and include novel activities and procedures designed by PSIP staff, they are essentially procedures approved and frequently employed by university/school consultants and by research agencies working with schools.

These specific elements and innovative features of the PSIP process are being carefully monitored and reported for formative evaluation purposes, and to maintain a record of effective and ineffective procedures for improving schools through utilization of the knowledge and products developed by educational research and development.

One projected activity of the PSIP, that is not a customary procedure used by research agencies or university/school consultants, is the intrinsic analysis of the programs or practices which remain as viable candidates after the field of potentially effective research and development outcomes has been narrowed to a few which meet the local action team's criteria and constraints. This projected analysis will be useful only under certain conditions and its use will, necessarily, vary considerably according to the nature and scope of the outcome considered. It may be used, also, to examine closely the present program, if it is to be retained in part or retained in its entirety with supplemental new elements.

The rationale for use of intrinsic curriculum analysis procedures, the description of those procedures, specification of the knowledge and skills necessary to carry out an intrinsic analysis, and identification of the information we can expect to attain if we use these procedures are the substance of this paper.

II. RATIONALE FOR CURRICULUM ANALYSIS

Selection of Curriculum Materials

When schools select curriculum materials they do it by a variety of methods, some formal, some very informal. We know of many cases when the charisma of the salesman, the attractiveness of the textbook illustrations, or the persuasiveness of the advertisements in professional journals have tipped the balance for a particular choice. Most selections, however, are made by committees following specific guidelines.

A report of Educational Research Service (ERS) analyzes selection procedures used in 414 selected school districts from 33 states and the District of Columbia (Kunder, 1976). The 17 states not included choose textbooks and instructional materials at the state level and therefore local districts have very limited choice. Of the districts responding to questionnaires, 72.7 percent have some kind of written textbook and materials selection policy, 27.1 percent do not (one school did not respond). For supplementary materials, only 50.7 percent have written policies, 49.3 percent do not. All states are governed to a greater or lesser extent by legislative requirements regarding curriculum materials selection.

One of the major problems for which curriculum materials policies are devised is not to determine the instructional quality of the materials but to ascertain that nothing offensive to any group of citizens is to be found in the materials. Recent challenges to textbooks and instructional materials were made in 26.3 percent of the 414 responding districts, 21.5 percent to supplementary materials. No challenges were reported by 69.8 percent and 65.5 reported no challenge to supplementary materials.

The ERS report identifies some of the issues confronting school districts in the selection of textbooks and instructional materials. Two of these are appropriate minority representation and avoidance of sex stereotyping. Often there are challenges to selections on the basis of religion, ethical, political and moral grounds. Of the schocl districts surveyed in this report, 66.2 percent have policies to deal with such challenges, 3.1 percent did not respond to this item and 30.7 percent do not have a policy.

Of the 414 responding school districts, 61.1 percent have general statements of criteria for selecting textbooks and instructional materials, 2.4 percent did not respond and 36.5 percent have no written statement of criteria.

Most of the elaborate selection procedures include meetings, sometimes called "hearings" with publishers' representatives (Kunder, 1976) and publishers often furnish the in-service training for implementation. These publishers' meetings are a protection against favoritism and possible dishonest dealings, but they provide an opportunity for the publisher to explain the product to the consumer and to respond to questions. Publishers' evaluation and descriptions of their own products, however, cannot be disinterested.

Criteria established by school districts usually are related to the district's goals, including integration, student self-image, appreciation of human accomplishments, acceptance of human similarities and differences, sensitivity to stereotypes, prejudice, bias, etc. Other characteristic criteria are accuracy, appeal, good organization, physical attractiveness and durability, match to school objectives, and appropriate articulation.

In summary, while a majority of school districts have written selection policies and established criteria, about 27 percent of the districts have no written materials selection policy for textbooks and 49 percent have no policy for supplementary materials among 414 school districts in 33 states. More than 26 percent have no established criteria, and even those with elaborate and quite specific procedures and criteria appear to rely quite heavily upon publishers' representatives for information about the materials and often for the teachers' in-service training for implementation.

Two states, Florida and California, include in their selection laws learner verification and revision clauses which put the responsibility upon the publishers for gathering data on their products and using them for improvement (Kunder, 1976, p. 17). This makes it necessary for publishers to base revision on results obtained in the classroom rather than merely on obsolescence of information, fads or attempts to increase sales.

Of course, research and development agencies typically employ pilot and field testing and use the information gathered for formative evaluation of the materials. Yet, like publishers, R&D agency developers are hardly disinterested evaluators of their own products when they do their own summative evaluations, and neither publisher nor R&D agency developer can provide as useful an analysis of a product or process as can the ultimate consumer whose needs and goals are unique.

Product presentation by developers and sales descriptions of publishers usually provide information about the theoretical basis for the product. The NIE product catalogue lists the subject area, goals or purposes, patterns of use, assessment provisions, time requirements, implementation procedures, summary cost information, personnel required for adoption and implementation, and assurances and claims. Materials and equipment included also are listed (Catalogue of NIE Education Products, 1975).

Mostly, however, information available to consumers emphasizes descriptions of products, indicating the presence or absence of various curricular elements, such as behavioral objectives, and claims about outcomes or results of using the products, rather than specific information about their quality.

Procedures for selection specified by school districts usually include examination of materials to identify presence or absence of elements identified as necessary and of value to that district. Usually, some of the questions raised in the selection criteria listings for consideration in reviewing materials require a judgment of quality on the part of the reviewer. However, none this writer has ever seen has specified a standard against which to make the judgment. That means, of course, that the quality of the review depends upon the specification of qualifications for membership on the selection committee and the care with which appointments are made to such a committee. Members of such committees include school board members, students, parents and civic leaders, who probably could respond to questions related to content, appeal, quality, or durability, and who probably should be involved in considering questions of match to goals, appropriateness to student population, bias, and other general questions. Also included are school administrators, teachers and staff specialists who might be better qualified to respond to questions of technical quality. Presumably, the non professional members of selection committees could defer to professional members on such questions of technical quality.

This paper suggests that selection processes should be more carefully tailored to the specific needs of individual schools and that part of the process of identifying appropriate products or processes should be procedures for intrinsic analyses of curricular materials and instructional processes using as criteria the identified needs of a school, and as standards of quality the research-based principles of instructional design and what the research says about each element to be evaluated.

An intrinsic analysis is an analysis of the curricular materials themselves. However, it is not limited only to materials used by students. The intrinsic analysis process may be used on teacher manuals, tests, and in-service training materials. It is not limited to instructional products but may be used, also, on management systems and other processes. What is required is materials, which I call the artifacts of the instructional system, so that they may be analyzed. They may be direct instruction in the form of readings, workbook exercises, tapes, filmstrips, or recordings. They may be directions to the teacher relating to her teaching behavior, to background information, to her management behavior, etc. They may be student or class record forms or tests. They may be scope and sequence charts. Any tangible evidence of the instructional program provides the input for an intrinsic analyses of that program.

The process of intrinsic analysis, which this paper proposes, employs procedures which can be taught to selection committees, analysis instruments to collect the information about the product or process and a decision-oriented comparative matrix for final selection. Before these are described, however, in the next section we examine the existing analysis instruments, which are used for much of the curriculum analysis that is currently available to school decision-makers.

Existing Analysis Instruments

Of the analysis instruments I have reviewed, the three most useful are those of Tyler and Klein (1971), Eash (1974), and that of Morrissett, Stevens and Woodley (1969). The first of these actually is a list of elements which are recommended as essential, very desirable, or desirable for selection of curricular materials. These are grouped in seven categories: rationale, specifications, appropriateness, effectiveness, conditions, practicality, and dissemination. The recommendations are addressed both to decision-makers and curriculum developers, since most of the essential elements would have to be supplied by the developer (e.g., the bases for the selection of the content of the curriculum and instructional materials). However, the recommendations are intended to help consumers in selecting materials and the authors suggest they would be useful, also, for evaluation of curriculum and instructional projects by funding agencies.

The Morrissett, Stevens, and Woodley instrument (1969) is called the Curriculum Materials Analysis System (CMAS) and has been revised several times. It was developed at the Social Science Education Consortium and has been used by teachers in making over 200 analyses since 1967. A publication of the Consortium, A Social Studies Curriculum Materials Data Book, has been published with more than 72 analyses of social studies curriculum packages. This system has major categories of questions of a general nature with subordinate questions which elaborate on those at the first level. Most questions require a scaled response such as very low, average, high, on a scale of 6, or NA (not applicable), UA (unavailable), and finally, there are spaces for indicating both degree of certainty of the response (C) and that the narrative statement about the materials should be read, see narrative (SN) (CMAS, 1971).

CMAS interjects the analyst into the process in a highly personal way. For example, one question is, "Do you agree with the rationale?" The document clearly is for teacher use and is addressed largely to teacher judgment of materials with minimal direction for how to make that judgment. The direction consists mostly of definitions of terms and single paragraph explanations of theory. It depends heavily on the experience and knowledge of the analyst-teacher, but it does not prescribe any specific required skills or preparation for the analysis task.

Ian Westbury, in an article on curriculum evaluation, dismisses CMAS and Tyler and Klein as instruments which "do little more than point out the most obvious questions that could be asked of a curricular document. They do not lead a critic into the structure of a program as such structure bears on more complex questions of evaluation" (1970, p. 251).

He thinks Eash's model is a little better because it does include questions about task analysis (1970, p. 252). "Has a task analysis been made of the material and some relationship specified between the tasks? If a task analysis was made, what basis was used to organize the materials?" (Eash, 1974, p. 129).

However, the Eash model is subject to the same criticism as CMAS, it does not indicate either skills necessary to perform the analysis nor does it inform the analyst how to uncover the information it asks for, if it has not been provided by the developer. It provides definitions as does

CMAS, but some of its questions are totally inappropriate. For example, the question on sequence asks the critic to check as many as appropriate and then lists supposed bases for sequence. Those listed are a hodgepodge of items, some related to structure of a discipline and some to instructional strategies. How one would use the responses to evaluate is difficult to discover. Probably each critic's judgment criteria would be different.

The Educational Products Information Exchange usually lists and discribes the instructional approach, available components (such as workbooks, teacher manuals, etc.), objectives and scope, sequence, methodology, evaluation and record-keeping, and then provides a summative evaluation comment. Such summative evaluative comments often are found in analyses. Most of the items in the instruments require that the analyst check off presence of or absence of elements and some require an evaluation of the elements on a rating scale. Eash also describes the typical characteristics of an element that should be rated low, average, or high. However, the bases are not given for judgment that objectives are vague, sequence is illogical or not detailed enough or that it is theoretically sound or unsound. All of these are among reasons for specifying a particular rating, but reliance is upon the critical judgment of the analyst. When the basis for that judgment is not supplied or even hinted at, the criteria used by the analyst for determination of a theoretically unsound curricular element, for instance, could itself be unsound.

In short most instruments currently used for analyses of instructional materials are primarily descriptive or are evaluative without establishing criteria for evaluation and therefore are useful only for initial screening to eliminate those products which clearly do not meet the needs of the individual school. To identify those which meet quality standards and which may meet identified student needs, instruments are needed for in-depth intrinsic analysis of the materials. In addition, there must be both criteria for responding to the questions in the instruments and procedures for carrying out the analysis. These procedures and practice in carrying them out and in applying the criteria to materials can be the substance of in-service workshops for teachers and administrators.

Two recommendations made by the Educational Products Information Exchange are (1) that training should be provided for members of textbook and instructional materials selection committees and (2) that adequate time and resources should be allocated for the task (EPIE, 1973). Both of these are of tremendous importance in the selection of any new instructional system. They become significantly more important when, as is usually the case, parts of a system are sought for adoption, for example, when supplementary materials are considered, or a new management system, or textbooks for one level in a classroom. Even when it is the basal text that is being replaced, if that is happening in a single grade, and if the other materials at that grade level, in that subject area, remain the same, training of the selection committee and adequate time and resources to make the selection are vital to the success of the adoption. This will be discussed more fully in the following sections.

How Analysis Can Facilitate School Decision-Making

While it is clear to anyone who has worked in or with schools or has read the research that teachers make a difference and that materials alone cannot have an appreciable effect on student achievement, it is obvious that schools, which spend a substantial amount of their budget on instructional materials, want to attain the most effective materials available for their students. The selection of high quality materials that have been proven effective has been considerably eased by catalogues of products of educational research and development centers and laboratories (Catalogue of NIE Education Products, 1975) and of exemplary programs developed by local school districts and validated by the Joint Dissemination Review Panel of the Department of Health Education and Welfare (Educational Programs That Work, 1976). Such catalogues provide an excellent first look at potential materials to meet school needs. If local schools are selecting new programs or practices without the help of selection facilitators such as the Pennsylvania School Improvement Program teams, these catalogues may be examined as a first step in the selection process after identification of their needs and constraints and establishment of the criteria they want to use in screening possible products.

Sometimes a program or practice appears to be exactly what the school is looking for. This can happen only when a local selection committee has a pretty clear idea of what it needs and wants, of course. In such a case it is often possible to have representatives of the publisher or the developer provide more information and even in-service training in the use of the materials. Often, it is possible to visit schools using the materials to judge at first hand how they look in operation.

However, in many cases schools have problems that are not so readily solved. Often schools want supplementary materials to meet needs of special groups of students, gifted children or underachievers. Often schools want to keep their basal texts but need to manage the classroom differently in order to meet individual student needs. They may want to adopt a new management system.

Even when a school is adopting a totally new program with the help of packaged or personalized publisher-supplied in-service training there is a need for a thorough analysis of the present program and the new program because parts of the present program still may be used and the adopted program certainly will be adapted to the needs of the adopting school. How to adapt requires substantial, in-depth knowledge of the materials, old and new, which will be combined to meet the school's requirements.

If the school does not find the suitable program or practice immediately, the identification of several possibles makes an analysis to facilitate decision-making particularly essential.

The steps in the process are:

1. needs analysis
2. present program analysis
3. identification of constraints and criteria
4. problem solution screening process
5. identification of possible products or processes
6. intrinsic analysis of possibles
7. summary presentation of these potential adoptions
8. selection
9. installation/adaptation
10. implementation

You will note that an intrinsic analysis takes place at step 6. It may take place, also, at step 2. Whether or not an intrinsic analysis is performed on the present program depends on several considerations. It may be necessary because the needs analysis has identified problems which may or may not be attributed, in part, to materials. Unless the deficiency in the materials, if any, is identified, it would be wasteful of time, effort, and money to search for new materials. On the other hand, if the teachers already have identified weaknesses in the materials and are seeking products that are superior along the dimensions identified as weak in their present program, no analysis may be required at this stage.

Another reason for an intrinsic analysis at stage 2 would be if the local selection committee (local action team in the PSIP process), during the needs analysis stage, should have decided that an inventory of available miscellaneous materials must be taken and they must be systematically coded to the program's objectives in order to provide a structure for individualization. After this procedure was completed, there would be essentially, a new program created which would require analysis in order to supply sufficient information on product or process needs to facilitate the succeeding stages of the process.

Stages 6 and 7 may be lengthy and time-consuming or they may be quite simple and brief depending on the preceding stages. If constraints and criteria are many, the number of identified products or processes may be very few and the screening process short with only one or two potential problem solutions identified. On the other hand, if constraints and criteria are few and/or if several needs have been identified, there may be many alternatives which the selection committee wants to consider.

Of course the analysis of curriculum products and of processes, such as management systems, use different information gathering instruments (see instruments in appendix). Both analyses are presented to the selection committee in the same format, a single decision-oriented matrix which includes ratings for each potential adoption along several important dimensions which will be discussed in Chapter II.

III. DESCRIPTION OF THE INTRINSIC ANALYSIS PROCEDURES

Elements of the Intrinsic Analysis Model

The Learning Research and Development Center has pioneered in the use of a model for evaluation, the Cooley-Lohnes Model (Cooley & Lohnes, 1977; Cooley & Leinhardt, 1975). This model employs six constructs for the investigation of classroom processes: initial student performance and criterion performance, opportunity, motivators, structure and instructional events. The constructs, have been used by the PSIP for collection and organization of data on present practices. In addition, information is collected on student, teacher, and community characteristics, broader constructs than initial and criterion student performance, because of the diagnostic rather than evaluation purpose of PSIP's data collection. Rationale for use of the Cooley-Lohnes constructs for this new purpose was based primarily on the opportunity to provide for building data on school change from a variety of R&D Utilization Project sites in consistent categories of educational processes that seem to be important to learning (Gow, 1976).

For materials analysis purposes, four of the constructs are used: opportunity, motivators, structure, and instructional events. The importance of the elements sampled by these constructs is well supported by research (Wiley & Harnischfeger, 1974; Rosenshine, 1971, 1976; Stallings & Kaskowitz, 1974; Walker & Schaffarzick, 1974; Cooley & Leinhardt, 1975; Brophy and Evertson, 1974; Amidon and Giammatteo, 1967; Lewin, Lippitt, & White, 1939; Goodman & Goodman, in press; Smith, in press; Berliner & Gage, 1976; Soar, 1973).

The use of the constructs for intrinsic analysis, as for data collection on present school program and practices, both suggests elements, which should be examined because they have been found to be significant factors in achievement, and provides an organizational framework for collection of the information.

The purpose of intrinsic analysis also draws upon an existing model, the Process Individualized Curriculum (PIC) model of curriculum design (Gow, 1977b). Just as the Cooley-Lohnes evaluation constructs have been put to two new uses, different from the evaluation purpose for which they were designed (diagnosis and analysis), so the PIC model is used as the conceptual and procedural basis for the intrinsic analysis of present program and potential R&D outcomes for adoption. Since the curriculum design model is based on research results also, it follows that the underlying design principles can be used to guide the analysis of existing curricula. The principles, then become the criteria for the analysis. The procedures for building a curriculum and the procedures for taking one apart rest on these same principles of effective instruction.

The intrinsic analysis model may be employed in a comprehensive study of proportions that would be best undertaken by an R&D agency or in a simplified, sampling and spot checking process that could be used by teachers in in-service workshops. In the former case, the entire hierarchy of expressed or implied behavioral objectives, which is essentially a blueprint of the course, is reconstructed. In the latter case, the hierarchy construction process is used only as a tool to sample the adequacy of structure. In both comprehensive and simplified analyses, the essential elements of the design model of the curriculum being analyzed are identified. The relationship between design and analysis has been shown by the following diagram (Gow, 1977a).

Design:	Instructional Model	→	Goals (Objectives)	→	Hierarchies	→	Instructional Materials
Analysis:	Instructional Materials	→	Goals (Objectives)	→	Hierarchies	→	Instructional Model

Objectives and hierarchy may or may not have been specified in the original design of the curriculum. Whether they were specified or they were not, objectives and some structural organization exist in any formal instructional situation and these are part of what the analysis process seeks to uncover.

The intrinsic analysis of instructional products and processes used, when appropriate, for both program and R&D outcome analysis by the research team and school assistance team of the PSIP employs both the Cooley-Lohnes constructs and the PIC design/analysis model. A description of the procedures for products and processes follows.

Products

The R&D Utilization Project, under which the Pennsylvania School Improvement Program is funded, calls the materials produced by research and development R&D outcomes. These outcomes include both products and processes. Many of the outcomes are described in the catalogues referred to previously. Some of the processes, such as the new more carefully tailored-to-site procedures that are being designed by this project, including the model for intrinsic analysis described in this paper, do not yet have completed tangible materials (artifacts) to be analyzed. They are being designed and tested as part of the project's task. Other processes, that may be adopted and adapted by the schools we are working with, have been used and validated elsewhere, include tangible materials describing and facilitating use of the process, and may be analyzed as described in the section on processes.

To analyze instructional products, materials which should be examined, include as many components as are in use or being considered for adoption and, at the minimum, lists of other available elements of the system. Preferably, samples of each element that is considered part of the instructional system, but is not to be purchased, should be obtained for examination. Products would include the following:

1. Instructional materials for students: texts, workbooks, tapes, filmstrips, supplementary readers, games, etc.
2. Teacher manuals for use with the instructional materials, record forms and other management system forms, tests, answer keys, planning booklets, etc.
3. In-service training materials to be used with the above instructional materials and management system.

For a curriculum that does not have explicitly stated objectives, the student materials are the main source of information about what content, concepts, and skills the curriculum is seeking to teach. To supplement the examination of the student materials, the teacher manuals or guides should be examined. These usually are quite explicit about the content, concepts and skills the curriculum seeks to teach, even when specific objectives are not stated.

Some rich curricula probably teach more than they test for or express as objectives. Consequently, if a skill is taught in the instructional materials and practiced in the student exercises, it may be assumed that skill is an objective of the curriculum, whether or not there is an expressed objective for it. Similarly, if a concept is introduced with multiple examples, it may be assumed that the concept is an objective. On the other hand, content, facts, and isolated examples of concepts may well not be objectives to be learned if they are not listed as such.

Important sources of input data for the analysis in addition to the artifacts listed above are the rationales and professional journal articles describing the curriculum by the developers and advertising materials written about the curriculum. These sources usually describe the educational philosophy of the developers and the specific goals of the curriculum.

The first step in performing an intrinsic analysis on a curriculum product is to gather the materials identified above and to scan them, as one would skim an article or examine a book, looking at format and general content. This inventory-taking process provides an initial sense of the nature of the total program.

The next step is to examine the student and teacher materials for dimensions which fall under each of the four constructs. Opportunity and motivators are attended first since the process is considerably less complex than that for analyzing structure and requires less background information than for analyzing instructional events. The process of analyzing for opportunity and motivators, if it is performed before the more demanding analyses, familiarizes the analyst with the materials and makes it possible for him or her to select sample portions of the whole sequence for in-depth structure and instructional events analysis.

Motivators are intrinsic in the materials or prescribed in the instructor's manual for the teacher to provide. In the latter case, note is made of motivators which appear to be crucial to the effectiveness of the materials and they are to be identified as elements of the curriculum model on the Curriculum Model Analysis Instrument. (See appendix for analysis instruments.) This must be noted because if the motivating element is to be provided by the teacher rather than the materials themselves, there is no way to be sure the directions are followed. If they are an essential part of the model, this must be duly recorded. Indeed, for each of the constructs, those curriculum elements which appear to be critical to effectiveness should be recorded when they are encountered, even though, when the analysis is completed they will be reviewed from the informed perspective of the analyst at the conclusion of the analysis process.

Many motivators in curriculum materials are obvious on superficial examination and are listed in descriptive analysis instruments. Of course, there is no need to duplicate these in the process of performing an intrinsic analysis. Just as cost and effectiveness information are considered part of screening rather than intrinsic analysis, also attractiveness and other motivational qualities which can be readily observed during initial screening are not attended in the intrinsic analysis process. The analysis instruments for curriculum products may be used for parent and teacher training materials as well as student materials.

The materials are examined to determine whether or not conditions are provided which research suggests are motivating to students. There are three major questions around which information is collected:

1. Is there an opportunity provided for the student (parent, teacher) to plan his/her own instruction?
2. Do materials provide experiences that clearly are functional (i.e., related to life-experiences)?
3. Do materials provide reinforcement or do they instruct the teacher how and when to do so?
4. To what extent do the materials make provision for individual differences in learning style, interests, pace?

Most of these questions and the more explicit questions subsumed under them can be answered readily by any education professional without specific further directions. However, in-service training suggestions, described in Chapter III would provide experience in carrying out this analysis. The more explicit questions, especially, are not difficult to answer, with the possible exception of a question on reinforcement which uses the term, Premack principle. However, this is described, with two examples, in a footnote to the instrument.

Opportunity is related to the density or intensity of instruction. Clearly, the materials themselves cannot reveal the amount of time spent on them. However, the intensity of the cognitive activity which they provide, and which the research suggests is related to achievement (Compensatory Programs Report, 1974), can be identified.

Questions asked under the opportunity construct relate to the concentration and appropriateness of the instruction. These, too, are identifiable by teachers or curriculum specialists without further instruction, although in-service training for analysis should include review of learning theory relevant to the teacher's own student population.

The questions raised in the analysis instrument under opportunity fall under two major questions:

1. Do the materials teach in a clear, focused and concentrated way, and
2. Are the experiences appropriate for the student population so there is opportunity to learn?

Probably the most difficult constructs to investigate in the process of performing an intrinsic analysis are structure and instructional events. Analyzing structure involves examining not only structure and sequence, but also, placement procedures, testing adequacy and exemplar appropriateness. Instructional events, in the context of an intrinsic analysis, are activities prescribed in the materials to be performed by the student or instruction to be carried out by the teacher.

It is in analyzing for structure that the hierarchy construction tool of the PIC design/analysis model is most useful. Here, careful sampling is of utmost importance. Depending on the purpose of the analysis, use of this tool may be extensive, involving a virtual restructuring of the curriculum scope and sequence, or it may involve a restructuring of the hierarchies of specified or implied objectives of one or two selected units.

The reason sampling must be used with care is that one may not assume that if a portion of a given curriculum is well-designed the rest of it must be equally well-designed. Often different authors are responsible for different grade levels of a single curriculum. It would be possible to overlook this if the analyst were not forewarned.

The procedures of the PIC model require prestructuring concepts separately from content and skills before merging the three structures into one hierarchy. In constructing this hierarchy, the logical order of content and concepts, the sequence of elements of the subject matter structure (concepts, principles, generalizations, and constructs), and the taxonomy levels of skills are considered.

In this context, content is viewed as information, events, and data at the knowledge level of the Taxonomy of Educational Objectives, Handbook 1: Cognitive Domain (Bloom, 1956). Concepts are those ideas associated with a particular discipline from which the structure of the discipline is formed. The concepts of a discipline involve both knowledge and process and may be identified by performing a concept analysis (Gow, 1977b). Skills include not only intellectual skills, which are called "behaviors" in the Bloom Taxonomy, but also any manual skills and learning management skills that are part of the curriculum's instruction.

The following steps are employed in restructuring the inferred instructional hierarchy:

1. The analyst performs a content analysis (logical sequence); concept analysis (subconcept, concept, principle, generalization, construct sequence); and skill analysis (taxonomic level).
2. These are combined to structure an instructional hierarchy which displays how the curriculum attempts to attain its goals and the interrelationships among the curriculum's goals and objectives.

Some curricula may specify objectives and present already-structured hierarchies (sometimes called scope and sequence charts, which may or may not be expressed in student behavior terms, although they can be converted to such terms). These hierarchies would be matched to instruction, observing discrepancies and omissions of objectives or materials to teach specified objectives. For curricula which do not have specified objectives and/or hierarchies, the materials are examined and the objectives inferred and structured.

If extensive use is made of the hierarchy construction procedure for intrinsic analysis, the hierarchies themselves provide a graphic presentation of what the curriculum attempts to do and how it does it. They present the process of instruction. They should, therefore, be presented to a selection committee as part of the rationale for any rating assigned to a curriculum product. They may be meaningful only to the analyst, however, if they are used only on selected portions of the curriculum. They provide input for the structure portion of the analysis instrument.

The analysis instrument includes the following categories of questions under the construct, structure:

1. Are there specific expressed or clearly implied instructional objectives?
2. Is there a testing procedure to determine mastery of the objectives?
3. Does the instructor's manual provide guidance for diagnosis and remedial treatment?
4. Are all objectives, stated or implied, measured or checked by observation, and are criteria provided?

The questions under these categories relate to the match of objectives to the characteristics and needs of the students in the particular school for which the analysis is being performed, the degree to which the instruction matches the expressed or implied objectives, the degree to which the testing matches the objectives, the adequacy of guidance to the teacher for diagnosis, placement and progression and for remedial or supplementary instruction, and the degree the range of objectives match the range of student population. These are questions related specifically to the hierarchies constructed for analysis. They require an indication of how well the objectives are structured and sequenced to build towards the terminal goals.

For the construct, instructional events, the analysis instrument for instructional products requires responses to the following questions:

1. Are the instructional strategies used appropriately according to instructional theory?
2. To what extent do the materials provide explicitly for the use of higher level skills (application, analysis; synthesis)?
3. Are the instructional methods consistent?
4. To what extent do the teacher manuals, in-service or parent materials furnish the following: (a) information in the subject area, (b) methodology, (c) vocabulary, (d) strategies?

Specific instructional strategies which have firm research support are listed under question one to remind the analyst of some of the possibilities to watch for. Of course, when the particular site has specific problems which seem to call for use of a strategy not listed, or when the student population identified by the local action team (LAT) for attention has special characteristics, such as perceptual problems, strategies appropriate for that specific population would be sought by the analyst in the instructional materials under consideration.

The identification of instructional strategies can be simply an inventory to define the instructional model more clearly. The process of identifying them also calls attention to neglect of strategies which might be particularly appropriate for certain kinds of instruction (e.g., modeling of psycho-motor skills; advance organizers for learning from reading, etc.).

Special attention should be given to concept-acquisition strategies. The kind and range of examples of each concept (content instances), their relevant and irrelevant attributes, should be noted. Failure to attain a concept may result from a defect in the instances encountered in instruction. Of course, when a hierarchy has been constructed for a portion of a curriculum, the range of content instances is quickly apparent from observation of the hierarchy.

Processes

The instrument for use when the school is searching for a management system, practice or process, rather than a curriculum product, is divided into questions organized under the same constructs as for products. The major questions under each category are as follows:

1. Structure: Are there specific process objectives (i.e., student self-management, learning-to-learn, maximal use of expertise by team teaching, etc.)?

2. Opportunity: Does this system or practice provide more time for learning?

3. Motivators: Does this system or practice offer advantages to both student and teacher which will encourage cooperation in implementing it? Does this system or practice provide the student with more independence in managing his own learning?

4. Instructional Events: Does this system or practice permit the teacher more time to interact with students on a one-to-one basis?

Management systems, practices and procedures must ~~be matched~~, not only to the characteristics of students, teachers, and administrators but also to the instructional materials whether they are those currently in use or new ones being adopted. Therefore, analysis of a process seldom would be performed alone. It would be, necessarily, a part of a more comprehensive program analysis.

Analysis as an Aid to Adaptation/Implementation

The hierarchy construction process reveals the underlying design model of the analyzed curriculum product or process. In the first section of this paper, a statement was quoted, objecting to the failure of simple analysis instruments to lead the critic into the structure of a program. The PIC design/analysis model, by strategic use of the hierarchy construction process, insinuates the analyst into the structure at any point which appears to present a problem or at significant places in the program. At the analyst's discretion, the entire curriculum structure can be reconstructed.

The analysis instruments call for information on characteristics and quality of design elements including methods, media and instructional strategies. The management system is carefully analyzed and the teacher props provided in the instructor's manual are identified and evaluated.

Throughout the analysis, the analyst is collecting information which facilitates his or her task of completing the instrument which analyzes the instructional model. This instrument includes the following questions:

1. What are the critical elements of this model?
2. Are these elements specified by the developer?
3. How do the materials support this claim?
4. If not claimed, what evidence is there that these elements are crucial?

5. How do the teacher materials inform the teacher of the essentiality of these specific model components?
6. Is further in-service instruction necessary or advisable?
7. What kinds of experiences are likely to impress upon the teacher the critical nature of these elements?
8. How can the facilitator (PSIP) provide these experiences?

This component of the intrinsic analysis procedure is expected to aid the adaptation process. It is a well known generalization about school change that adoptions seldom are adopted without adaptation to local needs. Indeed, even within a school, individual teachers tend to make changes according to the teaching style to which they are accustomed. Sometimes these changes are appropriate and necessary. Often, they undermine the principles which are critical to the effective implementation of the curriculum model (Gross, et al., 1971; Havelock, et al., 1969; Pincus, 1974; Goodlad, 1969).

By intensive intrinsic analysis, and particularly by using the hierarchy construction process, the analyst "gets inside" the curriculum to a degree that is not possible through any simple inventory or purely descriptive process. By using the criteria of the site for which the analysis is performed with the research supported principles of instruction as the only other criteria, each element of the product or process is weighed separately and in its relation to every other element, bringing the critical elements of the model into sharp focus.

Whether the analysis is performed by the local action team (LAT) or is presented to them by the research team (RT), these critical elements should be highlighted and plans should be made for impressing them upon all teachers and administrators who will be involved in implementation. The school assistance team (SAT) should plan training for implementation in such a way that a range of possible adaptations and of adaptations which would undermine the system (negative instances) are presented so the implementors will conceptualize the model. If adaptation is inevitable, it would appear to be wise to use every possible teaching strategy to assist the implementors in making their adaptations constructive ones.

IV. USES OF INTRINSIC ANALYSIS

Necessary Knowledge and Skills

For the persons who would supervise or carry out intrinsic analysis procedures as members of a research team (RT) or a school assistance team (SAT), a background in curriculum design and curriculum analysis would be helpful. More specifically, learning theory, instructional theory and applied instructional design principles are necessary knowledge and skills. It is important that the researcher have available up-to-date information on the research in the specific area of concern to the schools with which he or she is working.

In the PSIP plan of action, the knowledge consolidation function and the analysis function are carried out by the same team. The knowledge consolidation task includes synthesizing relevant research as it is needed, so current research information is readily available as input into the analysis process.

When analyses are carried out, under supervision, by local selection committees trained for the task, some of the behaviors which should be taught and practiced with sample materials, if they are not presently in the repertoire of the team members, are the following:

1. coding objectives to taxonomies
2. performing task analyses (minimally)
3. performing content, concept, component analyses (preferably)
4. matching objectives to tests
5. matching instruction to objectives and tests
6. identifying instructional strategies in student materials
7. analyzing the syntax of the student reading materials

Use of the Procedures by R&D Agencies

The full set of curriculum analysis procedures described in this paper are best used by R&D agencies which may be presumed to have staff with the necessary competencies to reconstruct the expressed or implied objectives of a curriculum into hierarchies and to chart them for cognitive and affective domains (if relevant) for each curriculum goal. (See appendix for elements of a typical charted hierarchy.) Indeed, this hierarchy construction process could be used to describe R&D outcomes and to present graphic representations of each such outcome permitting ready comparison among potential selections in a form which demonstrates the process of instruction as no inventory or descriptive analysis could do. Gaps and deficiencies become readily apparent and the adequacy or inadequacy of concept instances can be quickly spotted.

However, the time required to perform such a complete intrinsic analysis is prohibitive unless it is undertaken on a major scale as a dissemination strategy. Even the use of the model through sampling procedures as is being done by the research team of the R&D Utilization Project of PSIP is a very demanding process.

When a hierarchy has not been charted for each goal for presentation to the selection committee, and sometimes in addition to whatever charted hierarchies have been completed, a matrix is filled out by the analyst for selection purposes. This matrix lists as many outcomes as remain as potential adoption candidates after the local action team has narrowed the field as much as possible, screening it through their constraints and criteria and examining the actual materials. Each outcome is rated on the quality of structure (testing and sequencing); motivators (match of interest to this population and reward system); opportunity (intensity of instruction); instructional events (quality of teacher props); instructional strategies (appropriateness for this population, adequacy of strategy usage); and content (essential knowledge, essential concepts, essential skills). The matrix is accompanied by a support document which identifies the research support (from the literature search) and instructional theory basis for the rating.

This decision-oriented document facilitates decision-making. It does not prescribe. It will be necessary for the selection committee (LAT in the PSIP) to use the information presented, weigh the advantages and disadvantages of each outcome on the basis of the committee's own weighing of each element. For example, Outcome A may be rated higher on instructional events than Outcome B but lower on structure and motivators. Each outcome probably would vary along different dimensions. The rationale document could be consulted for details. The matrix would simply ease selection, not direct it.

In spite of the complexity and time-consuming characteristic of the intrinsic analysis process, there are so many advantages to it compared with the usual analysis process, it seems worthwhile to suggest some possibilities for its use with and by teachers on local action teams, as an alternative to its use by R&D agencies.

Use of Simplified Procedures With Teachers

The PIC Model for curriculum design/analysis has been taught to several hundred graduate students at the University of Pittsburgh, most of whom are teachers. Both as a design model for constructing courses and an analysis model for use by curriculum consultants working with university professors, it has been used to develop extra-mural courses and to analyze and formatively evaluate them in the University External Studies Program (UESP) of the University of Pittsburgh (University External Studies Program, 1977). There is no doubt, therefore, of the practicality of the model and its usefulness for teachers.

While the hierarchy construction process is the unique feature of the analysis model and an essential feature to reveal the flow, or process, of instruction, often lack of time prohibits full use of this procedure. In such cases, abbreviated procedures are used to sketch out rather than map out the structure and sequence. These abbreviated procedures involve the use of a kind of shorthand. For example, instead of a behavioral objective, a simple verb may be used or a taxonomy level. Sometimes, the three essential analyses (content, concept, skill, or component analysis) are not combined as they must be for design purposes. Each is evaluated separately. This does not provide the graphic roadmap that is such a satisfying and helpful feature of the model if it is used for presentation to the client for whom the analysis is performed. If the analysts are performing the analysis for their own use it is not necessary to combine the three separate analyses. A manual for instructional materials analysis, which will be a recipe book for use of the model in both the comprehensive and simplified versions is being constructed. It is expected that the manual can be used in one or two week workshops with local selection teams (LATs).

Among the competencies which would be taught to teachers are those identified in the first section of this chapter. Exercises would be required providing practice in matching objectives to tests, lessons to tests and objectives, identifying instructional strategies and constructing hierarchies.

When teacher teams perform analyses for their own use, it is possible for them to take many shortcuts. Since they have established the criteria and constraints and they will weigh the different dimensions as to their relative importance when they select among R&D outcomes which are rated separately for each design element, they also may decide in advance certain elements are of such overriding importance to them they will be analyzed and others excluded. In other words, once they have learned the analysis model, they may use it selectively for their own purposes. The model adapts readily to the needs of the local school.

V. THE INTRINSIC ANALYSIS PROCESS AND RESEARCH

Effects on Adaptation/Implementation

This paper has described an intrinsic analysis process which involves the use of a hierarchy construction tool as one technique in the analysis of instructional products and processes. The PIC model for curriculum design/analysis includes, also, the examination of instruction, as found in student materials and other instructional artifacts for research-based instructional strategies, their correct usage, and their evaluation on the basis of appropriateness for the student population for whom they are intended.

Out of this kind of intrinsic analysis the instructional model is deduced and the critical elements of that model are described in an attempt to facilitate adaptation of the product or process to the requirements of the adopting school with as little risk as possible of adaptation which might undermine effectiveness of the product or process. Of course, it was with the expectation that this emphasis on the critical elements of the model would discourage inappropriate adaptations that an analysis model highlighting these critical elements was selected for the RSIP procedures. However, whether or not it serves this function may depend, in part, on how effectively we are able to convey information to the teachers about the critical elements of the model and how successful is the in-service training for implementation.

It is suggested that a question researchers should address is the effect on implementation of identifying critical elements of the model and conveying this information to the school staff.

Another important question to be addressed is the effect of tailoring both information (knowledge consolidation outcomes) and analysis procedures to the needs of the individual school. In the PSIP process, there are always some criteria of the local school, which require analysis of special features of a product or process (e.g., individual learning style, grouping). Because the PSIP is concentrating on basic skills, the literature search resulted in a Synthesis of Research in Basic Skills (Gow, 1977c) which identified effective strategies in reading and math. Analysis for a school which identifies some aspect of reading, such as decoding, as a problem, would be tailored to search R&D outcomes for those which employ strategies endorsed by research as well as consensus recommendations of the reading specialists in decoding.

The evaluation data of PSIP are expected to contribute useful information to help answer these researchable questions.

Effects on Teaching Skills

The impact of a program such as the R&D Utilization Project cannot be measured solely by the attainment of its immediate goals nor even its long range goals. Among the latter, the establishment of linkages between R&D agencies, the state education department, and its intermediate units and local schools has resulted in many spin-off interrelationships which have encouraged graduate work for teachers, fostered training workshops, etc. One of the most important of these spin-offs can only be guessed at, but its parallel with some similar work at the university level suggests it should not be overlooked. That is, the effect, if any, of the process on teaching skills of selection committee members (LAT). It should be observed by those doing case studies on the project and would be an interesting subject for future research. In a situation where university professors are helped by curriculum specialists to analyze and rewrite their present curricula in order to make them self-instructional for use as extra-mural courses, the professors become aware of instructional design principles in the process. Many of these professors have never taken a course in the discipline of education and, indeed, are skeptical that it has anything to offer. Several of these professors have observed changes in their own teaching behavior and have commented on it to the curriculum specialists, who were trained in the use of the PIC design/analysis model, which is also used for the development of these extra-mural courses (Gow & Yeager, 1975; University External Studies Program, 1977).

The University (of Pittsburgh) External Studies case has many parallels with the change model in use in the PSIP Program. Most of the selection committee team members (local action team), of the schools with which we are working, are unfamiliar with the R&D Utilization procedures, do not at first recognize the value of them, and when they begin to understand the process, they appear to recognize its usefulness and value it. The intrinsic analysis part of this process, whether at the program analysis stage or the R&D outcomes analysis part of the selection process, is done by the PSIP research team and presented to the local action team. This is because of time constraints. The LAT could, itself perform the analysis after the kind of training described above.

It would be most interesting to know if the process of carrying out such an analysis would affect the teaching behavior of the team members. There are indications that even when the analysis is presented to the local action team by the research team, with the necessary rationale and explanation, the teachers begin to develop a new perspective on curriculum. They ask questions about how to match tests to objectives and about unfamiliar instructional strategies, take notes on them, and appear to be deeply interested.

Use of the Cooley-Lohnes constructs, repeated exposure to them in collecting needs analysis information, in program analysis and in outcomes analysis certainly should create, at the least, an awareness of their importance. The teachers, during these procedures, should acquire a significant body of information on each of these constructs in relation to their students, their program , and the potential programs they are considering for adoption. They should learn in the process of analysis, not only that strategies used should be appropriate for the specific students, but how they should be used; not only that test items should match objectives but that for matching test questions the items should be parallel in construction and for multiple choice items, distracters should be plausible. They should learn that not only should objectives (and instruction) be correctly structured and sequenced to permit each student to succeed and there should be branching sequences if the program is to provide for individual differences, but how structuring is designed and how it is analyzed.

Effects on Students

The ultimate aim of the Pennsylvania School Improvement Program, of course, is to provide more effective instruction for students. It would seem logical that if the selection process, a portion of which is described in this paper, permits schools to put together programs tailored to their individual requirements, students must, indeed, benefit from the better fit. Whether or not this is the case, of course, is, again, a researchable question.

The general categories of questions raised in this section relating to program effects on adaptation, teachers and students will be asked of and by all of the R&D Utilization Projects of which the PSIP is one example. The differences in the questions which we think must be answered, are related to the specific features of this intrinsic analysis model. We would like to know the effects, if any, of the following features of the model on students and teachers and on the kinds of adaptations that are made and their effectiveness:

1. The identification of critical elements of the product or process model and the emphasis on making the teachers aware that these elements are critical to effectiveness.
2. The tailoring of information and analysis procedures to the needs of the site.
3. The emphasis on research-based instructional design principles and research-supported instructional strategies.
4. The hierarchy-construction feature which permits the assembling of a unique collection of instructional materials, basic and supplementary, and of management systems suited to the site while retaining the kind of highly structured program the research supports.

VI. CONCLUSION

This paper has presented a rationale for the use of intrinsic analysis procedures, and specifically the PIC Model for design/analysis, to uncover the structure and process of instructional materials. This process does not duplicate information already existing in another form (i.e., NIE Product Catalogue, EPIE Analyses, CMAS Analyses, etc.). It does not describe outcomes or cost information. It makes explicit quality characteristics which can be compared. The model is flexible. Dimensions analyzed can be added or subtracted according to the purpose of the analysis.

An intrinsic analysis, as distinct from an evaluation which uses outcome measures and classroom processes, employs research criteria to make decisions about the adequacy of tangible curricular components in order to select, reject, supplement, complement, or change a given instructional product or process.

The identification of the critical elements of a program or practice becomes quite a simple process when the full set of hierarchy construction procedures of the PIC Model are used. This has been done for an entire elementary school science program, Individualized Science (IS) (Gow, 1977a). Identification of the model when a simplified intrinsic analysis is performed becomes more of an art than a science. Analysis of a range of R&D programs and practices for the R&D Utilization Project is expected to contribute to the refinement of this element of the model, hopefully helping to establish the limitations on simplification of procedures which still will permit enough manipulation of the artifacts to reveal the critical elements of the product or process.

The information derived from the analysis is organized under four constructs of the Cooley-Lohnes Model (1976) which represent dimensions of instruction which research has shown are important for learning. The Cooley-Lohnes construct, instructional events, refers in evaluation to interactions which are beyond the scope of an intrinsic analysis. However, if the instructional model requires that the teacher teach in a prescribed way, the quality of the props provided to facilitate these behaviors is important. This is examined in the analysis. It may be in the form of information, instructions or rationales for student exercises and prescribed teacher responses. In addition, the instructional strategies actually used in the materials, their appropriateness for the students for whom they are used, and the correctness of their use as prescribed by research evidence of effectiveness are analyzed. This process adds a new dimension and purpose to the Cooley-Lohnes constructs.

The hierarchy construction tool, also augments the Cooley-Lohnes construct, structure, since it suggests analysis procedures for supplying tangible evidence of degree and appropriateness of the structure of the materials being analyzed. Structure analysis involves examining the appropriateness of the sequence of instruction and the way students proceed through it. Therefore, an analysis of structure includes looking at the performance demands on the student to be sure they are taught how to behave in a certain way before they are required to do so.

Use of intrinsic analysis by R&D agencies and by teachers has been described and the required knowledge and skills for performing such an analysis have been specified.

Finally, some of the researchable questions growing out of the intrinsic analysis process have been suggested.

In PSIP, we expect that the entire selection process, involving, as it does the tailoring of procedures to the local situation, within the confines of the general model, will result in successful implementation of change. Evaluation of the project, including the case studies, should provide some indication of the accuracy of our expectations, and we can say with some confidence, before that evidence is collected, that the selection process we have designed is more rational than the traditional selection process described at the beginning of this paper.

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APPENDIX

Analysis Instruments

Student Materials, Inservice Materials, Parent Materials

Structure:

I. Are there specific expressed instructional objectives or clearly implied objectives?

A. To what degree do they match the identified characteristics and needs of the students in the target school (teachers, parents)?

B. To what degree does the instruction teach to the objectives?

II. Is there a testing procedure to determine mastery of the objectives?

A. How well do the test items, observation guidelines or other mastery criteria match the implied or explicit objectives?

B. How well are the objectives structured and sequenced to build towards the terminal goals?

1. as indicated by a concept analysis? (sampling)

2. as indicated by a content analysis? (sampling)

3. as indicated by a component analysis? (sampling)

III. Does the instructor's manual provide guidance for diagnosis and remedial treatment?

A. How adequate are the props which the instructor's manual provides to guide the teacher (I. U. or other agency instructor) in diagnosis of student needs and for placement and progression?

B. How adequate is the guidance supplied by the teacher's manual for alternate, remedial or supplemental instruction for students?

C. To what degree do the range of the objectives alone or the objectives combined with the remedial or supplemental instruction match the range of the student population?

IV. Are all objectives, stated or implied, measured or checked by observation and are criteria provided?

A. Affective

B. Cognitive

C. Psychomotor

Opportunity:

I. Do the materials teach in a clear, focused and concentrated way?

A. To what extent do the materials supply concentrated cognitive activity for the student (parent, teacher) to assure adequate opportunity to learn?

B. To what extent do the materials provide the opportunity to learn for both slow and fast students (i.e., clarity, explicitness in directions, small steps, transition sentences, etc.)?

II. Are the activities appropriate for the student population so there is opportunity to learn?

A. Are the activities appropriate for the developmental level and socio-economic characteristics of the student (i.e., concrete, manipulative for younger children; greater in-school exposure to oral language for low socio-economic level children, etc.)?

B. Are the examples provided relevant to the student experience, needs, stage of instruction, to provide opportunity for the student to conceptualize?

Motivators:

I. Is there an opportunity provided for the student (parent, teacher) to plan his/her own instruction?

A. To what extent does the student (parent, teacher) select instructional activities?

B. To what extent does the student plan his/her program?

II. Are materials functional (i. e., related to life experiences)?

   A. To what extent does math pose problems the student might be expected to encounter?

   B. To what extent are problems interesting and puzzle-like?

   C. To what extent are students taught the practical functions of reading?

III. Do the materials provide reinforcement or do they instruct the teacher how and when to do so?

   A. To what extent do they provide reinforcement by management and use of the Premack principle[1]?

   B. To what extent do they provide reinforcement by appropriate feedback, use of praise, students' ideas, etc.?

IV. Do the materials permit individualization of instruction?

   A. Are there a variety of modes of instruction?

   B. Are there alternative (branching) paths through the materials to accommodate individual differences?

Instructional Events:

I. Are the instructional strategies used appropriately according to instructional theory?

   A. To what extent do the materials provide the following in appropriate places and used effectively?

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[1] The Premack principle states that any high probability behavior can be used to reinforce any lower probability behavior. For example, a game the children enjoy playing can be promised "after you do these three math problems" or the student who does not like to read aloud but enjoys reading to himself can be told "read this sentence aloud, then you can read the rest of the story to yourself."

1. small steps
2. cues and prompts
3. questions in the textual materials
4. advance organizers
5. backward chaining
6. immediate feedback
7. reinforcement
8. appropriate range of content instances
9. specific strategies supported by the research in the target subject area

II. To what extent do the materials provide explicitly for use of higher level skills (application, analysis, synthesis)?

III. Are the instructional methods consistent?

A. To what extent do the methods used conform to the claims of the developers (i.e., if inquiry is claimed, does the <u>student</u> consistently inquire independently)?

B. To what extent are the instructional methods used appropriately (i.e., are the problems plausible and relevant to the students in a problem approach; does a phonic approach consistently demand the same word attack skills it teaches, etc.)?

IV. To what extent do teacher manuals, in-service or parent materials furnish the following?

A. Information in the subject area that teacher (parents) may not know.

B. Methodology--how to do it.

C. Vocabulary--definitions of terms.

D. Strategies--what to do that can be expected to be effective.

Management Systems, Practices or Processes

Structure:

I. Are there specific process objectives (i.e., student self-management, learning-to-learn, maximal use of expertise by team teaching, etc.)?

A. To what degree do the objectives match the identified problems in the target school?

B. To what degree are adequate instruction and/or explicit directions provided for the user of the system, process?

C. To what degree do the demands of the objectives match the capabilities of the students and teachers and the constraints of their environment?

Opportunity:

I. Does this system or practice provide more time for learning?

A. To what extent does the system or practice give the student more on task time?

B. To what extent does the practice or system give the teacher more time to actively teach or guide student learning?

Motivators:

I. Does this system or practice offer advantages to both student and teacher which will encourage cooperation in implementing it?

A. To what extent does it save the teacher time and/or effort?

B. To what extent does it help the teacher teach more effectively?

C. To what extent does it help the student spend more active time in learning what he/she finds interesting?

II. Does this system or practice provide the student with more independence in managing his own learning?

A. To what extent does the student have a chance to select his own topic, reading, activity, etc.?

B. To what extent does he have a chance to correct his own work, decide when he is ready to go on to a new activity?

C. To what extent is he/she permitted, encouraged, to plan his/her own time?

D. Is the student allowed to work with his/her own friends, tutor or be tutored or otherwise interact, cognitively, with peers?

Instructional Events:

I. Does this system or practice permit the teacher more time to interact with students on a one-to-one basis?

A. To what extent does the system relieve the teacher of management, clerical duties?

B. To what extent does the system permit students to manage their own activities so the teacher can serve as monitor and guide for learning?

C. To what extent does the system permit and encourage creative teaching by suggestion, example, instruction, etc.?

Analysis of the Curriculum Model or the Instructional Management Process

I. What are the critical elements of this model?

II. Are these elements specified by the developer?

III. How do the materials support this claim?

IV. If not claimed, what evidence is there that these elements are critical?

V. How do the teacher materials inform the teacher of the essentiality of these specific model components?

VI. Is further in-service instruction necessary or advisable?

VII. What kind of experiences are likely to impress upon the teacher the critical nature of these elements?

VIII. How can the facilitator (PSIP) provide these experiences?

THE PIC DESIGN/ANALYSIS MODEL

The PIC Model

The hierarchy construction process employs the Process Individualized Curriculum model or the PIC model (see Gow, 1977c). The procedures of the PIC model require prestructuring concepts separately from content and skills before merging the three structures into one hierarchy. In constructing this hierarchy, the logical order of content and concepts, the sequence of elements of the subject matter structure (concepts, principles, generalizations, and constructs), and the taxonomy levels of skills are considered.[1]

The content structure of most curricula is the easiest element to identify. However, for a curriculum that explicitly emphasizes concepts, the concept structure is more readily identified. The specific content instances may not be crucial for a concept-structured curriculum. What _is_ important is the range of these instances and the number of relevant and irrelevant attributes (Klausmeier & Hooper, 1974). For any curriculum, the concept structure should be identified and the content instances should be charted to display their function in concept acquisition. The evaluator who uses the hierarchy construction process can be confident that the hierarchies produced reflect the structure of the actual curriculum, whether or not it matches the designer's intent. The curriculum materials reflect the decision made by the designer in selecting from among alternative structures, and they are the evidence that limits the range of possible interpretations when an existing curriculum is analyzed.

[1] The use of the PIC model to construct hierarchies for curriculum analysis and evaluation is especially appropriate for individualized curricula. However, any formal instruction may be expected to have objectives built on one another as instruction proceeds. Both the objectives and the structure may be implicit rather than explicit, but they exist and can be charted.

Using the PIC model for analysis of a curriculum involves the following steps:

I. Carry out content, concept, and skill analyses and combine to structure an instructional hierarchy.

A. Some curricula may specify objectives and present already-structured hierarchies. These would be matched to materials, observing discrepancies and omissions of objectives or of materials to teach specified objectives. (The latter, then, would be noted for Step IV.)

For the curricula which do not have specified objectives and/or hierarchies, the materials are examined and the objectives inferred and structured.

B. To construct the hierarchy, concepts are analyzed by determining, across all levels (grades, or units in a single curriculum), the hierarchical sequence of concepts, principles, generalizations, and constructs. The content instances are then analyzed and placed under the appropriate level of the concepts of which they are examples. Finally, the skills are merged with concept and content instances to define, in behavioral terms, the implied objectives.

II. Identify instructional strategies.

A. The identification of instructional strategies can be simply an inventory to define the instructional model more clearly. The process of identifying them also calls attention to neglect of strategies which might be particularly appropriate for certain kinds of instruction (e.g., modeling for psychomotor skills; advance organizers for learning from reading; etc.).

B. Special attention should be given to concept-acquisition strategies. The kind and range of examples of each concept (content instances), their relevant and irrelevant attributes, should be noted. Failure to attain a concept may result from a defect in the instances encountered in instruction. The range of content instances, of course, is quickly apparent from observation of the hierarchy.

III. Describe the instructional model.

A. Identify specified or inferred goals and objectives and their interrelationships (from I above).

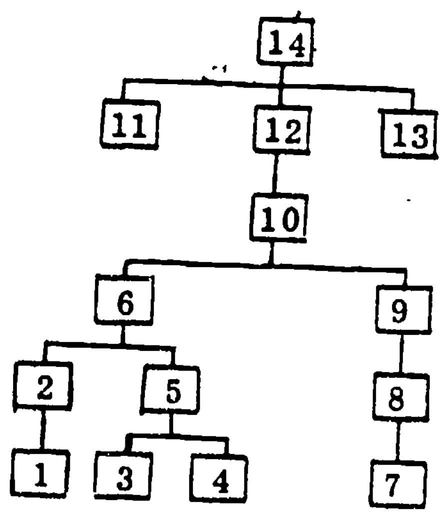
B. Specify principles of instruction used in the curriculum materials, management system and teacher directions (from II above).

IV. For further evaluative research, identify components of the curriculum which seem to suggest fertile fields for investigation.

Hierarchy Construction

In constructing the hierarchies, separate charts are built for the cognitive and affective domains and for other elements of the curriculum which represent separate expressed or implied goals. The levels at which objectives are charted depends upon the instructional sequence (if one is prescribed), the taxonomy level, the level of abstractness, and the concept level.

The elements of a typical hierarchy are identified in the following labeled example.



14	Terminal goal.
11, 12, 13	Subgoal of terminal goal.
10	Terminal objective of an instructional sequence.
6, 9	Subterminal objectives. Distinctive elements of terminal behavior.
1, 2, 3, 4, 5, 7, 8	Instructional objectives.
2, 5	Distinctive elements which are components of 6.
3, 4	Distinctive elements of 5.

The lines that connect objectives vertically represent dependency relationships. Horizontal lines connect separate elements that lead and contribute to a common objective, but that are not dependent on each other. The branches of a hierarchy generally represent different phenomena towards which the student's behavior is directed. They also may represent separate content of particular elements of a goal that make distinctive demands upon the student. The process of analysis calls upon the analyst's skills in identifying and categorizing distinctive features of such demands.

In preparing hierarchies for curricula with specified goals and objectives, a footnote is added when the wording of expressed objectives is changed by the analyst or when two or more objectives are combined. Footnotes also are added if rewording changes the meaning or emphasis of an objective, or if an objective is added to represent a learning experience for which there is no expressed objective, or if an objective is added to represent an untaught objective prerequisite to a specified objective.

For curricula that do not have expressed objectives, it is simpler to footnote those goals and objectives stated by the developer, instead of those implied or added. In either case, it is important that a clear differentiation be made between the developer's words and expressed intent and the analyst's words and inferences.