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ABSTRACT

This paper, which updates and expands on a paper by Twelker and others that identified and described five instructional development (ID) models, presents a taxonomy for classifying ID models, comments on the limited degree of testing to which most ID models have been subjected, reviews 13 models, and provides a selected, annotated bibliography of ERIC documents and journal articles announced in Resources in Education and Current Index to Journals in Education. A definition of ID and a discussion of its origins are followed by the taxonomy that is used to divide the ID models into four categories as they focus on the classroom, the product, systems, or organizations. Specific models are described and discussed in each of these categories: (1) classroom--Gerlach and Ely, Kemp, Davis and others, Briggs, and DeCecco; (2) product--Banathy, and Baker and Schutz; (3) systems--the Instructional Development Institute, Inservice Procedures for Instructional Systems Development, Courseware Development Process, and Gilbert Front End Analysis; and (4) organizations--Blondin, and Blake and Mouton. Thirteen figures illustrate the taxonomy and most of the models. A guide to searching ERIC for additional publications on ID models is included, and the annotated bibliography lists 10 journal articles and 11 documents. A list of 23 other references is also provided. (CHC)

SURVEY OF INSTRUCTIONAL DEVELOPMENT MODELS

by

Kent L. Gustafson

with an

Annotated ERIC Bibliography

by

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1981

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FOREWORD

One of the most popular and widely quoted publications from the ERIC Clearinghouse on Information Resources has been The Systematic Development of Instruction: An Overview and Basic Guide to the Literature, by Twelker, Urback, and Buck (ED 059 629). It was published in 1972.

Since that time, instructional development has grown substantially. Departments and centers in institutions of higher education have multiplied; the Division of Instructional Development has been established within the Association for Educational Communications and Technology (AECT); the Journal of Instructional Development is in its fourth volume; and personnel are being prepared for professional careers in the field. It seemed appropriate, therefore, to assess once again the state-of-the-art in the area of instructional development.

When Professor Kent Gustafson proposed that ERIC/IR publish an updated review of the 1972 monograph, we asked him if he would do it not only as a more contemporary statement, but also as a more substantive piece which would compare instructional development models, the sine qua non for all people working in this area. He agreed to do it.

This Information Analysis Product offers a comprehensive group of models and places them in a useful context. It is current; it is specific. We hope that it will serve the field well, as did its predecessor.

Donald P. Ely
Director
ERIC/IR

INTRODUCTION

Purpose

The primary purpose of this ERIC paper is to update and expand on an original paper by Twelker et al. (1972, ED 059 629) on the topic of instructional development (ID) models. In the years since the Twelker paper there has been a virtual flood of ID models appearing in the literature. It seems everyone has discovered the joy of creating his/her own model of the instructional development process and having it appear in print.

While the number of models has been rapidly expanding the real question relates to whether the knowledge and quality of ID effort have been similarly expanding. This question is easily answered: the answer is no. However, the reasons for the appearance of so many models are more complex and will be considered in this monograph.

A second purpose of this paper is to present a taxonomy which may prove helpful to the reader in examining various ID models. It seems apparent that the "unique" differences of every author's model fit into a rather simple taxonomy. A number of the more popular ID models will be presented and discussed as they relate to the taxonomy.

A third purpose is to report on the limited degree of testing to which most ID models have been subjected. Reasons for this lack of model validation will be hypothesized and cautions to the consumer will be presented. As in the used car market, caveat emptor is the watchword of the day.

Lastly, this paper contains an annotated bibliography of models and other relevant literature. While the bibliography is not exhaustive, it is believed to be representative. Any student of the ID process should find in the bibliography a number of models which could be easily adapted to the ID situation he/she faces. The bibliography is biased somewhat toward the older models. This may be due to the author's impending senility, but the "official" explanation is that much of the recent literature is essentially a restatement of earlier work and does not represent any intellectual step forward.

The balance of this paper is divided into three sections: a definition of ID and its origins, a taxonomy of models with several examples of each type, and a summary and conclusions. The annotated bibliography is found at the end of the paper.

Comments to the author concerning this paper (pro and con) would be most welcome and appreciated.

Definition of ID

One of the real problems facing persons working in the instructional development (ID) business is an identity crisis. The crisis is not that "I don't know what I am doing," but rather that "He/she claims to be doing ID, but it's not anything like what I do." In an attempt to resolve this concern, the Association for Educational Communications and Technology (AECT) established a committee charged with developing a definition for the term instructional development.

Under the leadership of Dr. Kenneth Silber, the committee arrived at the following definition through a long and arduous process:

> Instructional development. A systematic approach to the design, production, evaluation, and utilization of complete systems of instruction, including all appropriate components and a management pattern for using them; instructional development is larger than instructional product development, which is concerned with only isolated products, and is larger than instructional design, which is only one phase of instructional development. (1977, p. 172)

While this is a reasonable sounding statement that people might agree upon, it has not brought about the hoped for unity in the field. As will be discussed in the next section (and the bibliography will make painfully apparent), there is no universally accepted definition of the term. Nonetheless, for purposes of this paper, the above definition does provide an organizing framework. Thus, although there have been a number of instructional design models developed over the last few years, they do not match the broader definition of instructional development and hence are not included.

Differing Perspectives on the ~~ID Process~~

While just about everyone agrees that ID is a process, that is where the agreement ends. The author has identified at least three different perspectives from which the proces is viewed. Naturally, a developer's perspective has a lot to do with his/her notion of what constitutes a model of the process. As with the six proverbial blind men and the elephant, it all depends on where one chooses to look.

One perspective on the ID process (and ID models) is derived from general systems theory. The ID process itself is viewed as an integrated system with numerous interacting elements. As a consequence, the models stress communication, feedback, and prediction of the effect of one action on other parts of the system. The pioneer work of Leonard Silvern (1965) is an example of this perspective.

A second perspective would perhaps better be labeled systematic development. Persons holding this view feel that the ID process must be carefully described, and the models attempt to list all the necessary development tasks to be performed by the developer. The model by Hamreus (1968), and its intellectual heir, the Instructional Development Institute (IDI) model seem to fit well into this second class. The third perspective on the ID process might be labeled the prescriptive view. From this view our ID "elephant" is seen as requiring a precise series of statements on designing specific learning activities. The process is viewed much like a series of "if-then" statements. That is, if the learning is of type "x" and learner of type "y," then the learning activity should have given characteristics. Naturally the "if" portion of the statement can have several contingencies, and the "then" statement may also contain some qualifications.

Thus, while a national professional organization has prepared a definition of what the ID process "really is," it has done little to influence the perspectives and practices of professionals in the field. And, of course, these differing perspectives extend to their ID models. Hence, there is a need for a taxonomy such as that presented in this paper.

Differing perspectives on the ID process account for only part of the sizeable literature on ID models. All developers recognize the need for adaptation of models to local situations. While this is an honorable and desirable practice (which we hope this paper will facilitate), many of the adaptations are published as if they were new models. The situation is analagous to the automotive world announcing with great hype the "all new" model for this year. However, the changes are usually only cosmetic.

Thus, there is simply no need for developers to run frantically about collecting all the new ID models. The key to success for the practitioner is to have maybe a half-dozen really different models in his/her tool bag and know how to modify them for each new situation.

We now turn our attention to a more fundamental question: "Why are we so infatuated with our models?"

Why Models?

Instructional developers and their models have often been compared to Linus and his blanket. You never see one without the other. While other professionals share this trait, developers have elevated it to new heights. In the physical and natural sciences, models serve a variety of purposes, including theory building and testing, description, prediction, and explanation. However, developers seem to have much more limited purposes in mind. With apologies to the very few theorists in our field, typical ID practitioners use models primarily as: (1) communication devices with their clients and each other, (2) planning guides for management activities, or (3) prescriptive algorithms for decision making. While these purposes can overlap, the models tend to focus on a single function.

This single purpose application is understandable. If a model is to communicate with an unskilled client, it must be simple and devoid of much of our professional jargon. On the other hand, to be a useful management tool, it should account for all of the major tasks to be performed. If it is to be prescriptive, it must contain an extensive matrix-like structure for matching learning objectives and learning strategies. Thus, we arrive at the point where we are today, wherein one developer's valuable model is seen by another as worthless drivel.

We now turn our attention to some of the early classic ID models and the origins of the ID process.

Early ID Models

Of necessity, one must pick an arbitrary date from which to trace the origins of the ID model building process. Otherwise one can make the case that the snake in the Garden of Eden used a model to develop his obviously effective message. This is not to imply, however, that modern developers are direct descendants of said snake. (That issue is left for discussion on another day.)

The term "instructional development," defined as a process for improving instruction, appears to have had its origin in a project conducted at Michigan State University from 1961-1965. Entitled "Instructional Systems Development: A Demonstration and Evaluation Project" (1967), this project directed by Dr. John Barson produced one of the early ID models. Barson's model was reviewed in the earlier ERIC paper by Twelker et al. The reader is also referred to the Barson project final report (ED 020 673) for more details. The Barson model is notable in that it is one of the few models ever subjected to rigorous evaluation. The Barson project also produced a set of heuristics for instructional developers which continue to receive considerable attention.

Other early work by a number of authors also produced ID models, although they did not use the specific term "instructional development." The programmed instruction movement used a systematic process, but generally did not recognize the major contribution of the tryout and revision process to the successes it recorded. After the war, one of the most influential model builders was L. C. Silvern (1965). His work with the military and aerospace industry resulted in an extremely complex and detailed model (with variations) which drew heavily on general systems theory for its conceptualization. The model is not widely circulated today, but remains an excellent source document for those willing to wade through Silvern's rather turgid writing. Students of the ID process will readily see his influence on more contemporary model builders.

The model by Hamreus (1968), which he developed while at the Teaching Research Division of the Oregon State System of Higher Education, is another classic. One of his significant contributions was to present the model in a "maxi" and a "mini" version. This two-size approach recognizes the need for a simple model to communicate with clients and a more detailed version for the developer managing the project. Hamreus' model is evident in the Instructional

Development Institute (IDI) model (1971). The latter model has received extremely wide distribution and is among the best known in the United States. In fact, the IDI model and accompanying instructional materials designed to teach the ID process were reported to be the most widely used instructional materials in a recent survey of graduate programs in instructional technology in the United States. Since Hamreus' model was extensively reviewed in the Twelker paper, the reader is referred there for details. However, the IDI model, because of its wide circulation and notoriety, will be discussed in a later portion of this paper.

In addition to the Twelker paper, at least two other major reviews of ID models have been done and are worthy of study by developers. In 1972 Stamas reviewed 23 models by determining whether or not each included a list of model components he felt were desirable. This study, originally part of a doctoral dissertation at Michigan State University (Stamas, 1972), was also reproduced as an occasional paper by the Division of Instructional Development of the Association for Educational Communications and Technology. In 1980, Andrews and Goodson reviewed 40 models in the Journal of Instructional Development. Like Stamas they developed a matrix of ID elements and analyzed the models for their inclusion. They also attempted to trace a logical progression or evolution of later models from earlier ones, but were unable to detect any pattern. Their findings add weight to the view that the literature on models is circular rather than cumulative, with little of substance being added in the last few years.

A Taxonomy of Models

A scholarly wit once said that only two things are certain: death and taxonomies. This paper is no exception on the latter point. The present taxonomy is presented as having two benefits. First, the author and his students have found that creating a taxonomy is an excellent means of reducing an otherwise unwieldy body of ID model literature into a manageable package. Second, practicing developers can use the taxonomy to assist in analyzing the type of project on which they are about to embark. Then it is possible to select a model for adaptation to the specific situation. The approach helps eliminate the "I have a model, now what's your problem" syndrome.

The proposed taxonomy divides the world of ID models into four categories. The reader is cautioned, however, that like most taxonomies in the social sciences, the categories are a little fuzzy around the edges and not mutually exclusive. In fact, some can exist as subsets of others, so no absolute hierarchy should be inferred. The four categories are: (1) classroom focus, (2) product focus, (3) systems focus, and (4) organizational focus.

The first category of ID models has a classroom focus. The models assume there is already a teacher, some students, a curriculum, and a facility. The goal of the teacher is to do a better job of instruction within these constraints. The development situation often presents as a teacher who simply wants to improve his/her teaching. The teacher is not part of a team and improvement will be limited to his/her own classroom and only for as long as he/she chooses to use whatever results. Emphasis is usually placed on selecting and adapting existing materials rather than developing "from scratch."

A product focus is different from a classroom focus in that its goal is production of one or more specific instructional products. It usually assumes that development of the product is a "given." Further, the objectives may already be partially determined. The goal is to prepare an effective and efficient product as quickly as possible. The product is usually expected to produce replicable results with an audience possessing specified characteristics. Product models are common in both educational and business settings where decisions on whether or not development should be done are made by someone other than the developers. Often, but not always, this decision is made in the absence of objective data.

A systems focus is somewhat different from a product focus, but the latter in some cases may become a subset of the former. The systems focus has as its goal development of instructional output which itself is considered to be a system. The output of the development effort may include materials, equipment, a management plan, and perhaps an instructor training package. This "system" can then be implanted or disseminated to target locations. The systems focus usually demands extensive analysis of: (a) the use environment, (b) characteristics of the task, and (c) whether or not development should even take place. It is a problem solving approach usually requiring data collection to determine the precise nature of the problem.

An organization focus for ID has as its goal not only improving instruction, but also modifying or adapting the organization and its personnel to a new environment. Lately, much has been written about faculty development, organizational development, and instructional development as three distinctly separate but related activities. However, many instructional developers view their development role as containing elements of all three areas. The term Human Resource Development (HRD) has also become popular for describing this more comprehensive view of solving human and organization problems. A matrix comparing the four categories of models is presented below.

SELECTED CHARACTERISTICS

FOCUS OF MODELS	Typical Outputs	Resources Committed to Dev. Process	Team or Individual Dev.	Emphasis on Dev. or Select Materials	Amt. Front-end Analysis/Needs Assessment	Amt. Tryout and Recycle
Classroom Orientation	Hour of Instruction	Very Low	Ind.	Select	Low	Low to Med.
Product Orientation	Self Instructional Package	High	Ind. or Team	Dev. or Select	Low or Med.	Very High
System Orientation	Military School or College Course	High	Team	Dev.	Very High	Med. to High
Organizational Orientation	Team Building Activity or Policy Chg.	Med.	Team	Select or Dev.	Med.	Low to Med.

Figure 1. A taxonomy of instructional development models based on selected characteristics.

CLASSROOM ID MODELS

Assumptions

Classroom ID models are primarily of interest to professional teachers who accept as a given that their role is to teach and that students require some form of instruction. They include elementary and secondary school teachers, and most community college, vocational school, and university faculty. Some training programs in business and industry also assume this classroom orientation, but the systems focus is becoming much more common in such settings.

As indicated above, there exists a wide variety of classroom settings. Most teachers assume (with some real justification) that students will be assigned to or will enroll in their classes, and that there will be "n" number of class meetings each of "t" length. The teacher's role is to decide on appropriate content, plan instructional strategies, identify appropriate media, and evaluate learners. Due to the on-going nature of the instruction, often accompanied by a heavy teaching load, there is little time for developing new materials. Also, funds and time for development are usually limited. Hence there is concern with identifying existing resources for adaptation rather than original development. Also, since many elementary and secondary teachers teach any topic only once a year, they have less concern for the rigorous formative evaluation associated with courses and workshops which are offered on a highly repetitive basis.

Teaching personnel usually view any ID model as a general road map to follow. Very few functions are outlined in the model, and it simply provides a guide to the teacher. It should be noted that even general models of the ID process are not widely known to and adopted by teachers. The developer who works with teachers within the givens and assumptions described above would do well to employ any ID model with caution. The models discussed below have been found to be acceptable and readily understandable by at least some teachers and represent a class of models with which all developers should be familiar.

Five models have been selected to represent the variety of ID models most applicable in the classroom environment. The respective authors are: (1) Gerlach and Ely, (2) Kemp, (3) Davis et al., (4) Briggs, and (5) DeCecco. It should be noted that Briggs has created a number of ID models either alone of in conjunction with others (especially Gagne). Only one of his models is presented below.

Gerlach and Ely Model

The entry point of the Gerlach and Ely model (1980) calls for identifying content and specifying objectives as simultaneous, interactive activities. While Gerlach and Ely clearly prefer the approach of specifying objectives as a "first task," they recognize that many teachers first think about instruction from the standpoint of content. Their model is one of only a few which recognize this content orientation of teachers. Behavioral objectives are to be written and classified in order to decide on strategies. The classification scheme is based on Gerlach's other scholarly work and presents a five-part cognitive taxonomy and single category headings for affective and motor skill objectives.

The next step in their model is assessing the entry behavior of learners, a step common to four of the five classroom models. However, despite the specification of entry behavior as a major step in the ID process, few concrete procedures are provided. The next step is really five steps to be performed simultaneously. These steps are viewed as interactive, with any decision influencing the decisions available in the others; e.g., the design process is itself a system.

The five steps are: (1) determine strategy, (2) organize groups, (3) allocate time, (4) allocate space, and (5) select resources.

Under strategies they posit a continuum from exposition (all cues) to discovery (no cues). The teacher's/designer's role is to select one or more strategies along this continuum. Students can be organized into configurations ranging from self-study to whole-class activities based on strategies, space, time, and resources. Time is viewed as a constant to be divided up among various strategies. Space is not a constant, since it is pointed out that teachers can and should extend learning experiences beyond the classroom. Also, the classroom itself can usually be rearranged for different grouping patterns.

Selection of resources focuses on the teacher's need to locate, obtain, and adapt or supplement existing instructional materials. Emphasis is placed on where and how to find such resources and the

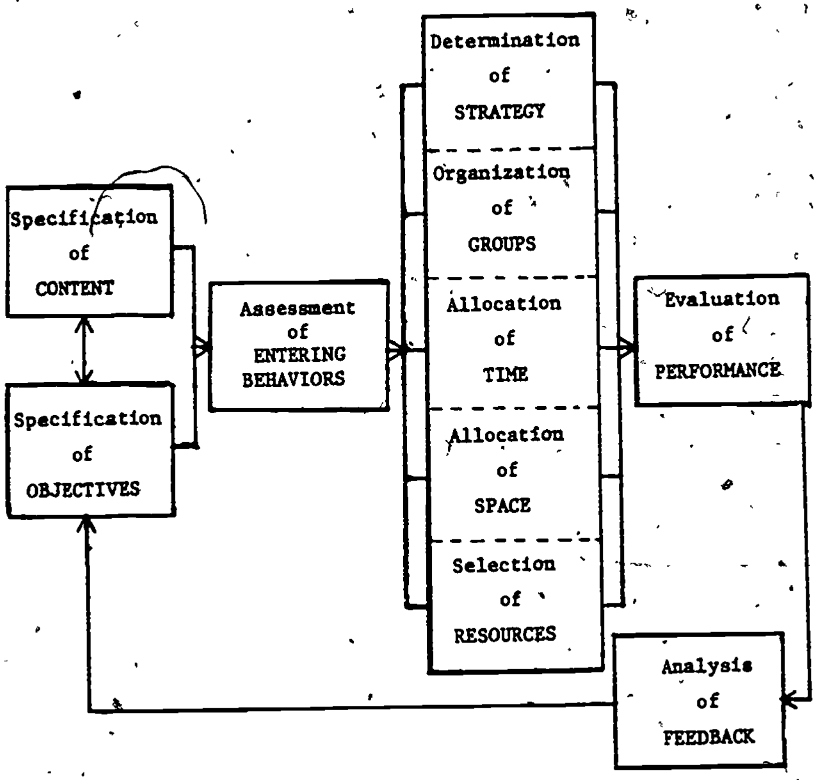

Figure 2. A systematic approach to instruction. (Gerlach/Ely/Melnick, TEACHING AND MEDIA: A Systematic Approach, Second Edition, © 1980, p.11. Reprinted by permission of Prentice-Hall, Inc., Englewood Cliffs, N.J.)

importance of previewing and planning for their use as a part of the overall instructional strategy.

Following these five simultaneous steps is evaluation of student performance. This step directs the teacher's/designer's attention to measuring student achievement as well as their attitude toward the content and instruction. Evaluation is seen as closely linked to the learner objectives stated earlier with attention also directed to evaluating the "system" itself. The last step in their model is feedback to the teacher regarding the effectiveness of the instruction. Feedback focuses on reviewing all earlier steps in the model with special emphasis on re-examining decisions regarding the objectives and strategies selected.

The Gerlach and Ely model is a mix of linear and simultaneous design/development. Several steps are seen as simultaneous, but the model is generally linear in its orientation. Its main strength is that practicing classroom teachers can identify with the process it describes. Its objective classification taxonomy is simple and non-threatening to teachers. Also, the authors relate the taxonomy to specific instructional strategies. Its main weakness is that it may unintentionally reinforce teachers and administrators in maintaining existing organizations and staffing patterns rather than re-examining the entire basis of how schools should operate.

Kemp Model

Jerrold Kemp's model (1977) is similar in a number of ways to Gerlach and Ely's. He states there are three essential elements of instructional technology: (1) what must be learned (objectives), (2) what procedures and resources will work best to reach desired learning levels (activities and resources), and (3) how we will know when required learning has taken place (evaluation). Kemp's model suggests that ID is a continuous cycle with revision as an on-going activity associated with all eight steps. He feels the teacher/designer can start anywhere and proceed in any order. This is essentially a systems view of the development process wherein all elements are interdependent and may be performed simultaneously if appropriate.

Although Kemp's model indicates the developer can start anywhere, it is presented in a conventional framework starting with goals and carrying through evaluation. The classroom orientation of the model is apparent through Kemp's choice of the words, goals, topics, and general purposes for determining what will be taught. These words can be readily accepted by classroom teachers. The second step is to enumerate important characteristics of the learners. These include such academic factors as number of students, GPA, IQ, and reading level, and such social factors as age, maturity, and attention span.

The third step is specification of behavioral objectives. He suggests using Bloom's taxonomy for categorizing objectives and ensuring that a broad range of objectives is included. The fourth step, specification of subject content, illustrates the non-linear view of development position taken by Kemp. Content is to be organized, but Kemp is rather vague as to how this should occur. He does make reference to the work of Gagne and to task analysis as a technique, but the chapter on content specification is quite brief.

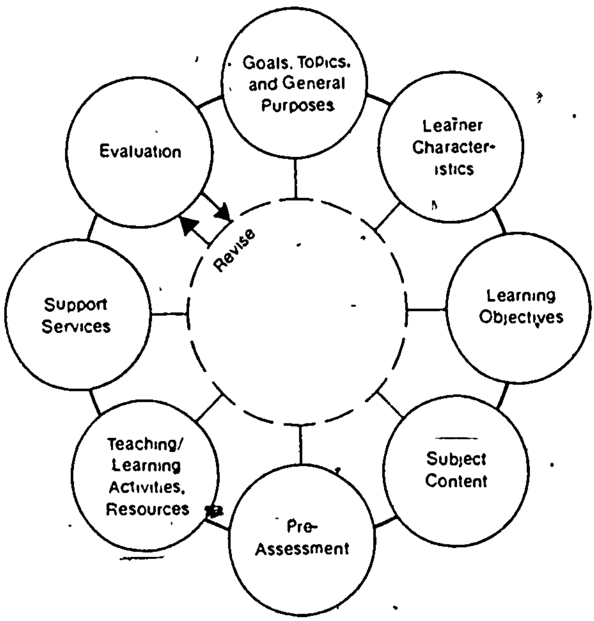

Figure 3. (From INSTRUCTIONAL DESIGN, Second Edition, by Jerrold E. Kemp. Copyright c 1977 by Fearon Pitman Publishers, Inc. Reprinted by permission of Pitman Learning, Inc., Belmont, California.)

Pre-assessment is the next step in his model. By this he means testing for both prerequisite skills and learner achievement of the objectives. Prerequisite testing is concerned with content required before the planned instruction while achievement testing is an assessment of current content.

Teaching/learning activities and resources is the step at which decisions are made regarding instruction strategies, grouping, media, and other resources. He combines into this step most of what Gerlach and Ely have separated into five steps. His media selection model is a subset of the overall model and focuses partially upon size of group (large, small, independent study) and partially upon Dale's Cone of Experience (direct concrete to verbal abstraction).

Step seven is support services, by which he means identifying what additional resources will be required to support the instruction, e.g., funds, facilities, equipment, and support personnel. The last step, evaluation, includes both formative and summative data collection. Kemp indicates that it is necessary to evaluate both the learner and the system in any comprehensive development process. The inner dotted circle of his model is intended to emphasize the importance of viewing the development process as a dynamic activity with all elements subject to constant interactive review.

From a teacher's perspective, the strength of Kemp's model is the concept of starting "where you are." Also, the emphasis on subject matter content, goals and purposes, and selection of resources makes it attractive to teachers. A major weakness is the lack of specification in the step dealing with teaching/learning activities and resource selection and utilization.

Davis, Alexander, Yelon Model

The Learning Systems Design (LSD) model was created by Robert Davis, Lawrence Alexander, and Stephen Yelon (1970). Consisting of eight major steps and one sub-step associated with two of the main steps, it presents development as being more linear than in Kemp's model, but acknowledges that some steps may occur simultaneously. An overall framework for the eight-step process consists of three elements: analysis, design, and evaluation. As the graphic display of the model indicates, the steps are not discrete within the elements of analysis and design.

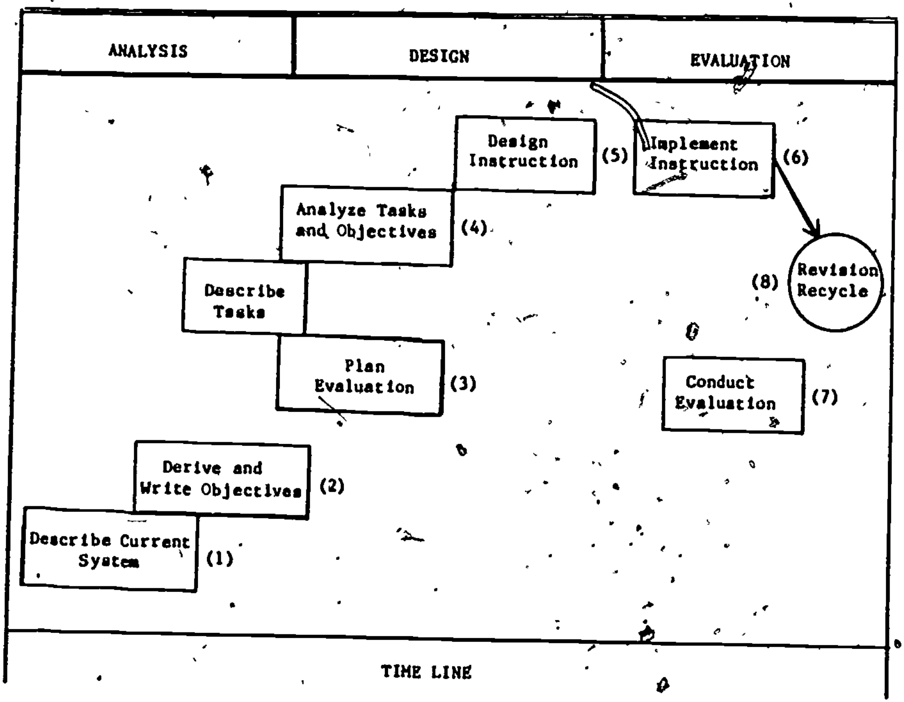

Figure 4. A time-line graph illustrating in a somewhat idealized way the learning system design process. (From LEARNING SYSTEMS DESIGN by Robert Davis, Lawrence Alexander, and Stephen Yelon. Copyright © 1974 by McGraw-Hill, Inc. Used with permission of McGraw-Hill Book Company.)

The LSD model begins by describing the current system. This includes gathering information regarding the number of students, their background, how they are similar and different, and strengths or weaknesses of those offering the course(s). Such data gathering clearly reflects the classroom orientation of their model. Further, they note that development seldom starts from "scratch," indicating their focus on on-going instruction. The second step--derive and write objectives--is similar to other models in requiring their statement in behavioral terms. Step three--plan evaluation--focuses on properties of good tests for measuring student achievement and attitudes. Mention is also made of the need to evaluate the system. Their chapter on testing is a good basic treatment of the topic which teachers and developers would do well to review.

Analyzing tasks and objectives is the fourth step, and it is linked to the third step by a sub-step, describe tasks. The sub-step is primarily an argument for using task analysis and task description in developing and ordering objectives. This substep and step four may cause confusion for some teachers/designers who would see analysis as part of the process for deriving objectives. In step four the objectives must be placed into six types of learning, although only four (concept learning, principle learning, problem solving, and perceptual-motor skills) are seen as being relevant to most teachers. The influence of Gagne is quite apparent in their model.

Step five, design instruction, attempts to match instructional strategies with types of learning, primarily from a behaviorist orientation. In fact, the bulk of their book is really a treatment of behavioral psychology as it relates to the learning objective hierarchy presented earlier. Little mention is made of media, other resources, or logistic considerations in the design step. The sixth step is to implement instruction, but little information is provided concerning how this is to be done. The seventh step, conduct evaluation, is done concurrently with step six. This includes student testing and evaluation of the system. The matrix for data analysis for purposes of revision included in the eighth step is a simple but useful tool.

In reviewing the Davis, et al. model, its greatest strength may also be its greatest weakness. Its strength is the considerable amount of detail presented on learning psychology as applied to instructional design. However, this is at the expense of less depth of treatment for the other steps in the model. By itself, the model and accompanying text would not suffice to teach a teacher/designer much of what is necessary to systematically plan a real course. This is somewhat surprising since the model appears in a textbook designed for pre-service teachers. Instructional developers should note that a series of sound filmstrips and workbooks is also available to accompany this text.

Briggs Model

The ID model by Briggs (1970) is only one of several he has created. This one is clearly intended for classroom teachers. The model has ten steps and is presented in a more or less linear fashion. Since many of his steps are similar to those in the other class-oriented models, only those steps which are somewhat unique are reviewed in any detail here. Briggs' first step calls for the statement of objectives and performance standards in behavioral terms. Step two involves the preparation of tests over these objectives. In step three, the objectives are analyzed for structure and sequence. To accomplish this, Briggs suggests asking what the learner would need to do before he can attempt the present objective. Then types of learning are identified using Gagne's hierarchy and the items are placed in the hierarchy and numbered from 1-n. The resulting sequence provides the basis for the instructional sequence in the design step.

In step four, entering competencies are identified, and pre-tests and remedial instruction are prepared in step five for any students who lack the prerequisites. The question of what happens to such students is a crucial one for classroom teachers since most do not have the luxury of simply denying access to those not matching pre-specified conditions.

Briggs' concern for these students is apparent from the sub-set of steps (5a-5c) devoted to the remediation issue. He suggests as one alternative that an adaptive program be developed. A second alternative is to screen out or simply accept the students and let them drop out if they can't perform, an alternative he does not really favor. His third alternative includes planning a dual track program. Briggs' consideration of alternatives as identifiable sub-steps in an ID process is somewhat unique and is the primary reason for including his model in this review.

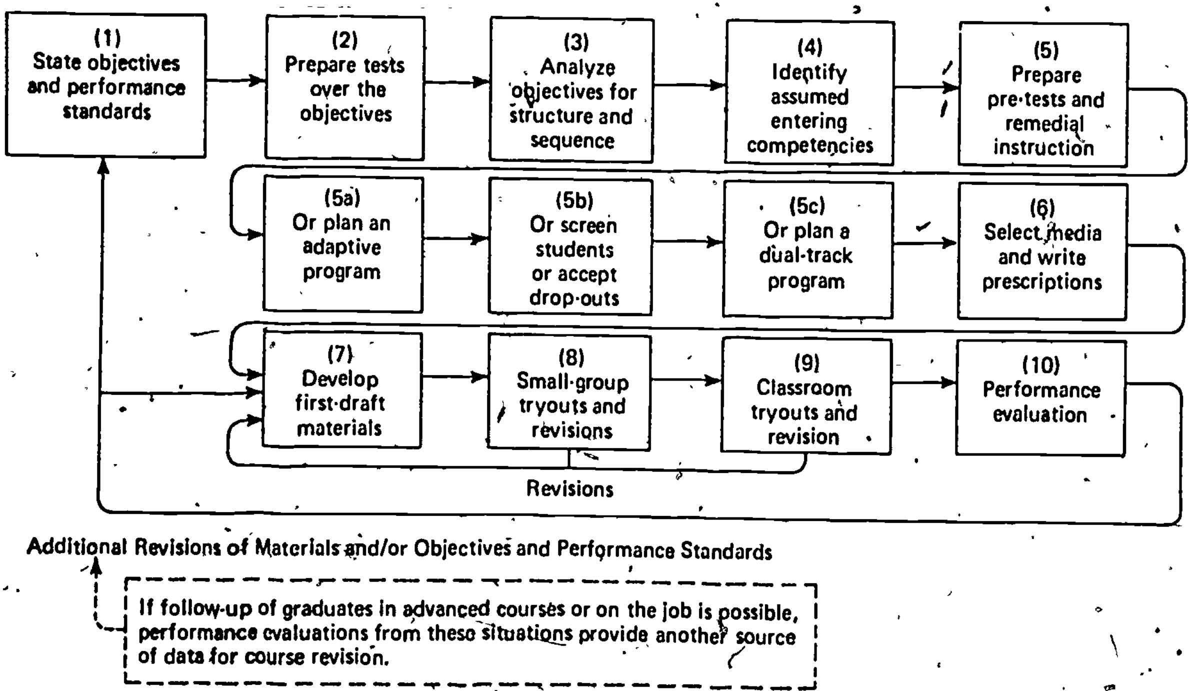

Figure 5. Flow chart: A model for the design of instruction. (From Handbook of Procedures for the Design of Instruction, by Leslie J. Briggs © 1980. Reproduced by permission of Leslie J. Briggs.)

Step six proceeds to the selection of media and writing of instructional prescriptions. Briggs has done considerable work on attempting to systematize media design and selection. (Although his work in this area is well-worth examining, it is beyond the scope of this review.) Step seven—develop first draft materials, step eight—small group tryout and revision, and step nine--classroom tryout and revision, reflect Briggs' earlier work in programmed instruction and are similar to other ID models. Briggs' emphasis on extensive tryout and revision make this model most applicable when a population for such testing is readily available and multiple cycles of instruction are planned. The last step, performance evaluation, measures both the final performance of students and the delivery system. Recycling to the objectives or to design of another prototype of the instructional material follows unsatisfactory system performance.

Briggs' model has several strong points, including its concern for students who lack prerequisites and how to deal with media selection. Further, in the narrative he provides extensive information on the input and output of each step in the process. This may also be a weakness in that such a detailed treatment may turn off teachers/designers unwilling to wade through all the detail. Also, the implied linear approach may not be acceptable to many potential consumers for this model.

<u>DeCecco Model</u>

The model published by DeCecco in 1968 is not an ID model, but rather a teaching model with boxes and arrows. It is included as representative of a number of so-called systems models that teachers and developers will encounter in the literature. These models do have the advantage of being easy to understand and provide a spring-board for later "graduation" to a more tightly specified ID approach.

DeCecco's model begins with a statement of instructional objectives according to the gospel as specified by Mager. Entry behavior of the learner must also be assessed and compared with the original statement of objectives before proceeding to step three. The third step is specifying instructional procedures. Learning is divided into skills, language, concepts, principles, or problem solving, and a strategy is presented for dealing with each type of learning. The fourth and last step is assessing the performance of learners. If the

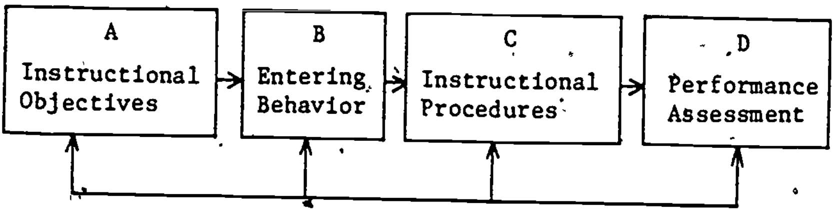

Figure 6. A generalized model of instructional development. (John P. DeCecco, THE PSYCHOLOGY OF LEARNING AND INSTRUCTION: Educational Psychology © 1968, P12. Reproduced by permission of Prentice-Hall, Inc., Englewood Cliffs, NJ. This work is an adaptation from a work that originally appeared in "Psychology and Instructional Technology," in TRAINING RESEARCH AND EDUCATION, Robert Glaser, editor. Published in 1962 by the University of Pittsburgh Press. Used by permission.)

desired level of performance is not achieved, the teacher recycles to the appropriate step and repeats the process.

The DeCecco model does have the virtues of objective specification, evaluation, and revision. To a novice teacher/designer it may provide an unthreatening introduction to several basic concepts of instructional development. However, it fails to ask why the instruction is being offered, or what alternatives are available for teaching the objectives. In addition, the simplistic treatment of evaluation (testing students) leaves much to be desired. No review of the ID literature could be complete without reference to this level of model, but any judgment regarding the utility of such models is left to the reader.

Summary of Classroom Models

The treatment of teacher-oriented development models is somewhat more lengthy than the other sections of this paper for two reasons. First, there are well over 2,000,000 teachers in the public schools in addition to many others in private schools, community colleges, proprietary schools, and universities. The vast majority of these teachers have had little exposure to the concepts of systematic development and represent a tremendous challenge to developers wishing to modify the form and structure of formal education. Without understanding and support from these teachers, there is little likelihood that developers will have significant impact on the instructional process. The models presented in this section of the paper provide a reasonable framework for communication with teachers. The more elaborate, and in some cases mechanistic, models reviewed elsewhere probably do not have such potential.

A second reason for reviewing these several models is that classroom models have received less attention in the ID literature. Whether this is due to their classroom orientation or other factors is unclear, but it cannot be disputed that classroom models are not often published in the literature consumed by professional instructional developers.

PRODUCT DEVELOPMENT MODELS

Assumptions

Product development models are characterized by three key features: (1) an assumption that the instructional product is desired, (2) considerable emphasis on tryout and revision, and (3) an assumption that the product must be usable by a variety of "managers" of instruction. The assumption of need should not necessarily be considered a limitation of these models. In some settings a front-end analysis has already been conducted and needs determined for a variety of products. The task then becomes conducting the development efficiently and effectively. Also, in a number of situations, the need is so obvious, that it is unnecessary to ask "should," but only "what" types of questions. An example would be the need to develop an operator training package for a new word processing device which is about to be marketed.

Extensive tryout and revision often accompanies product development because the client cannot, or will not, tolerate low performance. Also, the performance level may be externally established; e.g., the operator must be able to use all the capabilities of the word processor. This is in contrast to educational settings where the performance level is often subject to considerable up or down adjustment. Cosmetic appearance of the product may also be important to the client, thus making subjective evaluation an important part of the tryout process.

Use of the product by managers as opposed to teachers simply means the product is often required to stand on its own without a content expert available to the learner. An example would be instructions to a telephone company lineman on how to install a specialized piece of equipment not normally used in that location. The demand for free standing products is another reason tryout and revision are emphasized in product development. As computer-based instruction has become more popular, the demand for effective instructional products has increased and is likely to expand even more rapidly in the future. Hence, the demand for efficient and effective prescriptive models unique to a variety of settings and products will probably explode in the decade of the 80's.

The two models chosen for review in this section are (1) Banathy and (2) Baker and Schutz. Although the authors of these models recognize the role of the larger system in instruction and the desirability of that type of meta-analysis, each model is best applied at the level of product development.

Banathy Model

The model published by Banathy begins with formulating learner objectives which can be measured objectively. Banathy suggests that objectives include statements of "what" is to be done, "how well," and "under what conditions." He further indicates that objectives must be refined and further refined until they are specified at the task level. Following objective specification, a test is developed to measure them as step two of the model. Little attention is paid to test development in Banathy's text, probably on the basis that well developed objectives make test development a relatively straightforward task.

Analysis of the learning task comprises step three and receives considerable attention. In fact, three sub-steps are presented as a sequential set of development tasks for this step: (1) analysis and inventory of learning tasks, (2) assessment and testing of input competence, and (3) identification and characterization of actual learning tasks. By learning tasks Banathy means the skills, knowledge, and attitudes the learner must have as prerequisites (or at least desirables) prior to attempting the new objectives. The list of learning tasks includes both content knowledge and general communication encoding and decoding skills of the learner. Sub-step two, input competence, is distinguished from learning tasks in that it is an assessment of what the learner already knows which transfers directly to the new objectives. Input tests are suggested to avoid placing the learner in a situation which is too elementary or too advanced. Sub-step three, identification of learning tasks, consists of two activities. First, the developer subtracts the input competence of the learner from the statement of objectives. Second, the remaining objectives are categorized by type of learning. Banathy suggests using Gagne's taxonomy for this purpose.

Step four, design the system, has four sub-steps: (1) function analysis, (2) components analysis, (3) distribution of functions among components, and (4) scheduling. Functions analysis requires

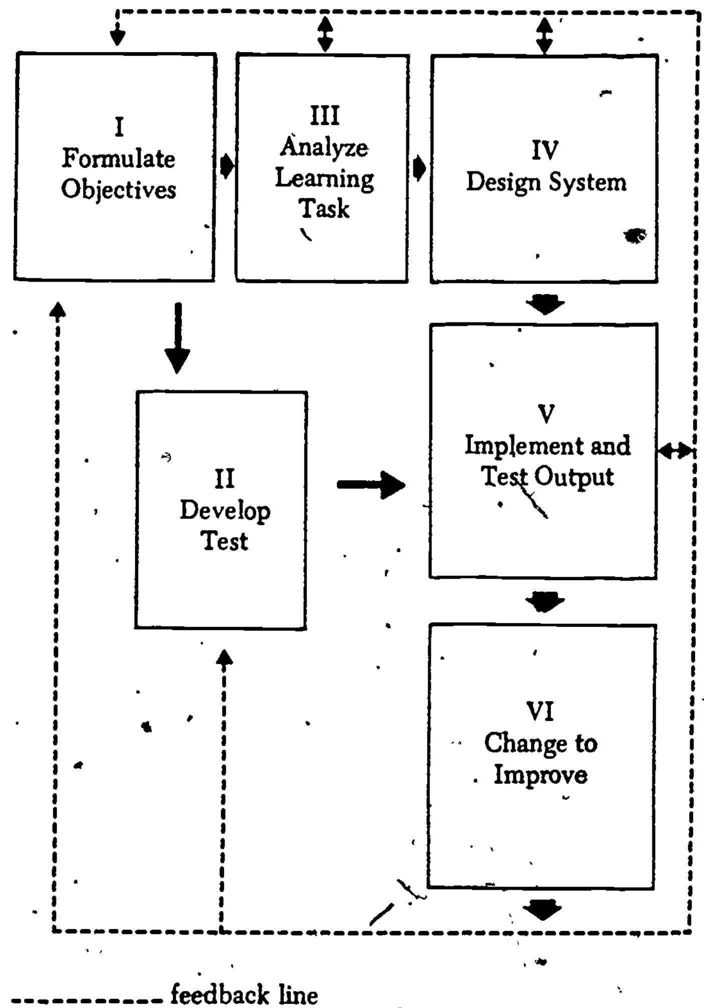

Figure 7. An over-all structure of the design of an instructional system. (From INSTRUCTIONAL SYSTEMS by Bela H. Banathy. Copyright c 1968 by Fearon Publishers, Inc. Reprinted by permission of Pitman Learning, Inc., Belmont, California.)

specification of what must be done and how. Components analysis specifies who or what has the potential for doing it. Distribution of functions is concerned with who or what will do exactly what. Scheduling specifies where and when it will be done.

Step five proceeds to the implementation and testing of the output of the system. Prior to implementing the system, there must be system training and system testing. Testing may involve a simple walk-through or a more elaborate simulation of all elements of the system. System installation follows training and testing and continuous evaluation is conducted. Evaluation and quality control of both the instructional process and its output (learners) may require "on-line" adjustments rather than waiting for some later date to review the system. Step six does specify change and improvement, but this is reserved for more extensive changes that cannot be made during initial implementation and testing. Clearly the emphasis is on rapid feedback and ongoing change to the system whenever possible.

The major strength of Banathy's model is its emphasis on testing and revision (called monitoring and quality control). Its major weakness is its lack of specification in the design stage. Simply suggesting that objectives be categorized and strategies developed leaves the developer very much to his/her own devices.

Baker and Schutz Model

Unlike most other authors, Robert Baker and Richard Schutz do not present the reader with a graphic model of the process they promote. Rather, they discuss three characteristics of product development: continuous trial and revision, team development, and a user orientation.

They also enumerate five requirements of any instructional system and 11 characteristics of any program which they represent on a two-way matrix. The matrix becomes a type of team planning document and checklist which reminds developers of the need to account for all systems and program characteristics. As can be seen, this matrix becomes a useful tool for developers who are preparing systems for implementation and management by others.

Discussion of each characteristic would be more lengthy than is warranted in this review; however, several unique elements will be

I Program Systems / II System Characteristics	1 Outcomes	2 Instruction	3 Quality Verification	4 Monitoring	5 Personnel	6 Data	7 Interfaces	8 Procurement	9 Information	10 Continuity	11 Costs
Instructional											
Training											
Installation		A									
Accountability											
Modification											

Figure 8. A guide for the specification of instructional program requirements, materials, and procedures. (From Instructional Product Development by Robert Baker and Richard Schutz.)

examined. One unusual characteristic is training of personnel to manage the system, an area often overlooked by developers. Cost and cost effectiveness data are other areas often neglected by developers, but they will become of increasing concern given the economics of the coming decade. Accountability of the people and the system requires an ongoing management system for data collection and decision making that also makes this model somewhat unique in the literature.

The major strength of the Baker and Schutz model is its comprehensiveness. Developers would do well to use it as a checklist even if they prefer other models to guide their planning and development. Its major weakness is its lack of specification for the 55 cells in the matrix; their book is quite uneven in its treatment of the cells and does not systematically relate the matrix to the various chapters. Their chapter entitled "Rules for the Development of Instructional Products" is a list of what others have called heuristics. But a rule by any name is often the best guidance a developer has given the current state of the art. Their book also contains many exercises for the reader to perform, with feedback provided for each exercise. Despite its shortcomings, it is recommended to both novice and veteran alike.

SYSTEMS DEVELOPMENT MODELS

Assumptions

Instructional systems models are characterized by four key features: large scale team development, linear development, wide distribution of the results of the development, and a problem solving orientation. The models usually begin with a data collection phase to determine the feasibility and desirability of developing an instructional solution to a "problem." A number of the models require that a problem be specified in a given format before proceeding. Thomas Gilbert's (1978) work in front-end analysis is highly relevant to the models discussed herein. His position is that, while a problem may have an instructional solution, one should first consider lack of motivation or environmental factors as alternative areas of action. Systems models, as a class, differ from product development models in the amount of emphasis placed on analysis of the larger environment before committing to development. Systems models also assume a larger scope of effort than product development models. However, in the design, development, and evaluation phases, the primary difference between systems models and product models is one of magnitude rather than type of specific tasks to be performed.

The three systems models selected for review are: (1) Instructional Development Institute (IDI), (2) Interservices Procedures for Instructional Systems Development (IPISD), and (3) Courseware Development Process (CDP). Because of its relevance to systems models, the front-end analysis matrix of Thomas Gilbert is also presented.

The IDI Model

The Instructional Development Institute (IDI) model is one of the most widely publicized ID models in existence. It is taught in many professional preparation programs, and has been the focus of a national workshop for large numbers of public school personnel. In the earlier ERIC paper by Twelker, et al. (1972), the IDI model provided the frame of reference for analyzing other models. It is included in the current paper because of its wide and continued circulation.

INSTRUCTIONAL DEVELOPMENT MODEL

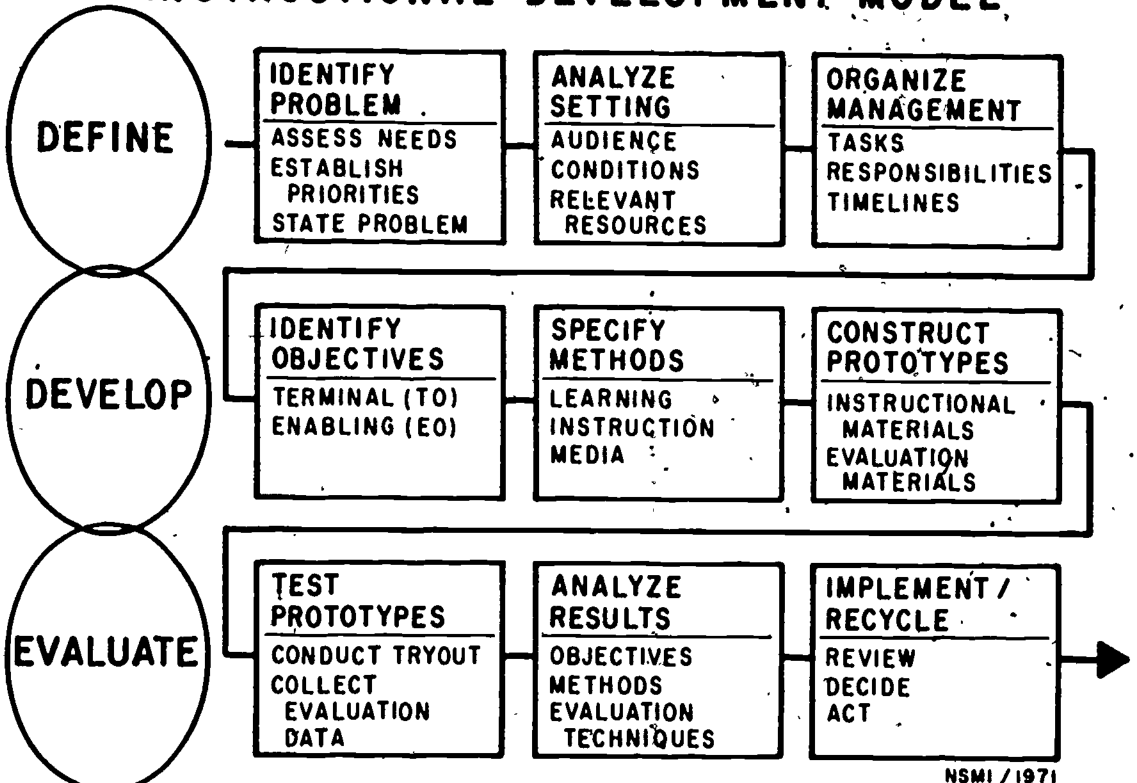

Figure 9. (From University Consortium for Instructional Development and Technology; formerly National Special Media Institute.)

The model is a joint effort of the University Consortium for Instructional Development and Technology (UCIDT), which was originally known as the National Special Media Institute. Created as a tool for public school personnel who desire to tackle large-scale instructional problems, the IDI model is problem oriented, specifies team development, and assumes distribution or dissemination of the results of the effort. It is similar in a number of its steps to an earlier one created by Dale Hamreus, and many developers consider it as simply a variation on Hamreus.

The IDI model is essentially linear in its approach. The claim is briefly made that ID can be non-linear, but the procedures accompanying the graphic model provide no evidence of how this can be accomplished. The model has three stages and nine steps, with each step further sub-divided for a total of 24 elements. In essence, the model is conceived as being useful at all three levels of detail--stages, or steps, or elements.

The model is reviewed here at its intermediate level of detail since the 24-element level would result in a lengthy description. The IDI's first step is to identify the problem. This requires conducting a needs assessment, establishing priorities among various and conflicting needs, and, finally, stating one or more problems to be addressed. Emphasis is placed on separating symptoms from problems and stating problems in measurable terms. This permits later assessment of progress toward alleviating or solving the stated problem. Step two--analyze the setting--specifies additional data collection to be performed regarding the previously stated problem. Data are collected concerning audience (learner) characteristics, characteristics of other affected personnel, conditions under which development must occur, constraints on any solution, and what relevant material and human resources are available for both developing and delivering the solution.

Step three is to organize the development team. This step is somewhat unique to the IDI model. Its creators made this step highly visible because of their belief that poor management often leads to failure of development efforts. Organizing management includes stating all major tasks, assigning responsibility for those tasks to team members, and establishing timelines for their completion. Monitoring of progress is also included as part of this step.

Step four--identify objectives--is similar to other models in requiring behaviorally stated objectives. The mnemonic ABCD is a helpful reminder that objectives must include an Audience (A), Behavior (B), Condition (C), and Degree of performance (D). Step five--specify methods--uses a taxonomy developed by Edling and Hamreus (later modified by Merrill and Goodman (1970)) for classifying objectives, and then selecting strategies and media based on the type of objective. The strategies and media prescription matrix is viewed as a set of suggestions rather than a rigid matching activity. Designers/developers are encouraged to use whatever additional knowledge they have to make final determinations.

Step six--construct a prototype--prescribes building testable drafts of all the materials. This includes instructional units, teacher-/manager instructions, and evaluation materials. The emphasis is on constructing a prototype that is complete enough to test, but not so expensive that it cannot be changed. The seventh step specifies testing the prototype under conditions as similar as possible to its eventual use. This step is often called formative evaluation in other models. Step eight specifies analyzing the results in terms of learner achievement, effectiveness and practicability of the methods of instruction, and appropriateness of the evaluation techniques.

The last step in the IDI model is to recycle (if the data indicates a deficiency) or to implement the solution, if it is effective. Recycling to any previous step should be considered, but it may be necessary to return to the original problem and re-analyze needs. It should be noted that, in recent years, the UCIDT Consortium has developed a workshop on dissemination that is an extension of the model to another step, but the original model has not been modified.

The basic strength of this model is its three levels of detail. This permits its initial presentation to non-developers in a simple form which can then be elaborated as their knowledge increases. Its basic limitation is the implication of a linear step-by-step development process beginning with definition of a problem. This limitation is common to most systems models.

The IPISD Model

The Interservices Procedures for Instructional Systems Development (IPISD) model is, as the name suggests, a joint effort of the U.S. military services; the Army, Navy, Marines, and Air Force created this model in the interest of utilizing a common approach to instructional development. The motivation was to facilitate shared development efforts and improve communication with contractors doing instructional development across different branches of the military. Of course, the underlying concern of each service was to have a rigorous procedure for developing effective instruction. A large number of personnel contributed to creating the IPISD model; however, the name most commonly associated with it is Robert Branson.

Similar to the IDI model, the IPISD model has several levels of detail. At its simplest level it has five phases: analyze, design, develop, implement, and control. These phases sub-divide into 20 steps which can be further divided into hundreds of sub-steps. In fact, the IPISD model is one of the most highly detailed models of the ID process generally available to the profession. It is published as a four volume set (Branson, 1975) and can be ordered from the National Technical Information Service (NTIS) or ERIC (Branson, et al., 1975).

Since a detailed review of all the steps in this model is beyond the scope of this paper, it will be reviewed only at the phase level. The reader should keep in mind that the IPISD approach is designed specifically for military training in the skills/job area; most other models have a much broader range of intended applications. The narrower focus of IPISD is both a blessing and a bane. Its virtue is the extremely detailed level of specification it contains. However, the price of this specification is its lack of generalizability to other environments.

Phase one of IPISD--analyze--requires specification of the task which personnel perform on the job. Tasks which are already known or easy to acquire are subtracted, and a list of tasks requiring instruction is generated. Performance levels and evaluation procedures are specified for the task, and existing courses are examined to determine if any of the tasks are currently being taught. A decision is then made either to modify the existing course to fulfill task requirements or to plan a new course. In the latter case, parts of an existing course may be adapted for the new one. The final step in phase one is to determine the most appropriate site for instruction; i.e., school or non-resident instruction.

Phase two--design--begins with the arrangement of job tasks into instructional outcomes classified by the learning elements involved; i.e., mental skills, physical skills, information, and attitudes. Tests are generated and validated on a sample of the population and

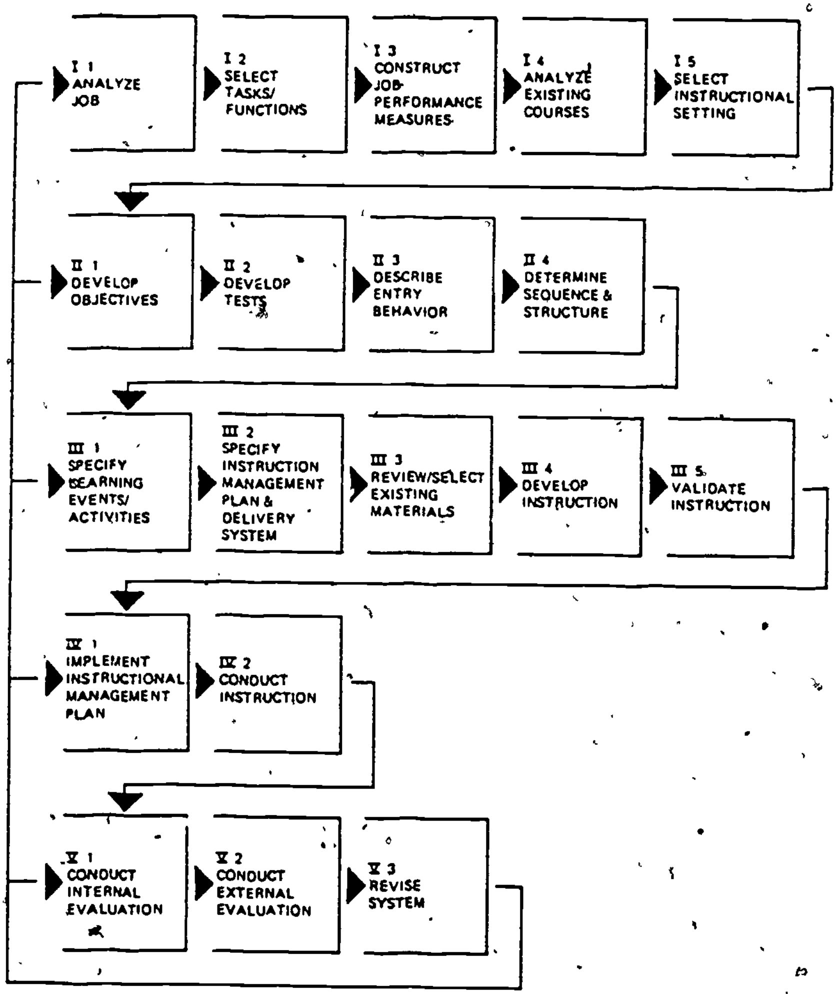

Figure 10. IPISD model: Detailed breakdown of activities to be performed in each phase. (From Interservice procedures for instructional systems development: Executive summary and model. TRADOC Pamphlet 350-30, August 1, 1975).

instructional objectives written in behavioral form. Next, the entry behavior expected of typical students is determined, followed by the design of the sequence and structure for the course. Design stage specifications are then forwarded to phase three of the process.

The development of prototype materials occurs in phase three of the model. Development begins by specifying a list of events and activities for inclusion in instruction. Media are then selected and a course management plan developed. Existing instructional materials are reviewed for their relevance and, if appropriate, adopted or adapted for the course. Necessary new materials are then produced and the entire package field tested and revised until satisfactory learner and system performance are achieved. The development phase concludes when the entire course package is ready for large scale implementation as phase four of the model.

Phase four—implement—includes training for course managers in the utilization of the package, content training of subject matter personnel, and distribution of all materials to the selected sites. Instruction is then conducted and evaluation data collected on both learner and system performance.

Phase five—control—is the last part of the IPISD model. Internal evaluation is performed by "on-line" staff who are expected to make small-scale changes to improve the sytem after each offering. In addition, they forward evaluation results to a central location. External evaluation is a team effort directed toward identifying major deficiencies requiring immediate correction. External evaluation also follows course graduates to the job site to assess real-world performance. Changes in practice in the field are also monitored to determine necessary revision of the course. Thus, the emphasis in phase five is on quality control over an extended period of time.

The major strength of the IPISD model is the extensive specification of procedures to follow the ID process. It is an excellent reference for students who are in training to become developers. Its major limitations are its narrow instructional focus and linear approach to ID. Further, the level of analysis and prescription it specifies could only be done by a heavily staffed, highly financed organization. Use of this model requires a real commitment of substantial resources on a long-term basis. This model will find little use outside the military, government, and a few large corporations having major job training programs.

Courseware Development Process Model

The Courseware Development Process (CDP) model is owned by Control Data Corporation, a major computer manufacturer (1979). The CDP model was created to provide a guide for developing courses within the company. While many of the courses are computer-based or computer-managed, the model does not assume any role for the computer.

Unlike the two models just reviewed, the CDP model conceives of development as a circular, rather than a linear, process. The graphic is drawn as a circle to indicate that development may begin at any one of several stages.

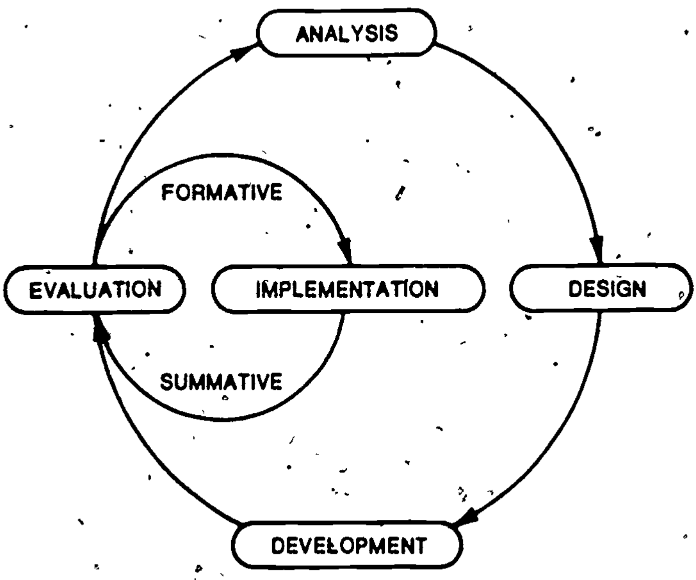

Figure 11. The development process. (From Courseware Development Process, © 1979 by Control Data Corporation. Reprinted by permission.)

For convenience, this review (like the CDP publication) begins with analysis. The CDP model includes six major phases: analysis, design, development, evaluation (part I), implementation, and evaluation (part II). Each phase is further sub-divided into a series of steps which are not reproduced in the graphic above.

Phase one--analysis--has as its purpose determining the nature and scope of the required training. If training is found to be necessary, a management plan is developed for the project. The CDP model calls for a survey of existing resources which, if available, lead the project directly to the evaluation phase. Of particular note is the question: "What will happen if the problem is allowed to continue?" This suggests that, even if a problem exists, it may not be worth the time and effort required to correct it.

Phase two--design--has eight substeps common to most models: (1) perform task analysis, (2) specify objectives, (3) define entry behaviors, (4) group and sequence objectives, (5) specify assessment system, (6) specify learning activities, (7) specify evaluation system, and (8) review/select existing materials. The results of phase two are fed to phase three.

The development phase requires design of individual lessons and construction of test items. Although the model is often used by DCD for developing computer-based materials, it specifies development of materials in a variety of formats including text, computer-based, and audiovisual materials. Computer management routines and programming are also listed in the model. Review of content and editing complete phase three of the model.

Formative evaluation is phase four of the process. This begins with a one-on-one tryout of draft materials followed by revision. Audiovisual materials are then produced and a small-group pilot test conducted. Revisions are made as necessary, final editing done, and a technical and mechanical review performed. This latter step is essential to computer-based materials to ensure that no "bugs" or "open loops" exist in the instruction, testing, or learner prescriptions.

Phase five--implementation--requires reproducing all materials, establishing support services, and training instructors or managers if required. Instruction is then provided and data collected on both learner and system performance. Phase six--summative evaluation--relates results back to the original problem. Data from implementation are analyzed along with data on trainee performance in the field.

A decision is then made either to modify the course or to continue to utilize it as it exists. Implied is the requirement for continued summative evaluation over time.

The major strengths of the CDP model are its non-linear perspective and accounting for the unique needs of computer-based instruction and management. Its major limitation is the lack of specific procedures to accompany the general statements contained in the model.

Gilbert Front End Analysis

Thomas Gilbert (1978) has made a major contribution to systems thinking through his writings on front-end analysis. His matrix for performing an initial analysis of the probable cause(s) of unacceptable human performance should be required reading for all instructional developers. Gilbert posits three major categories of explanations for inadequate human performance: motivation, environmental factors, and lack of knowledge or skill. Competent instructional designers/developers should examine all three areas before deciding to develop instruction, since an instructional solution assumes knowledge or skill to be the primary causal factor. Gilbert uses a number of case studies to make the point that often the real cause is lack of motivation or some condition in the environment; e.g., the machine should be re-designed.

Gilbert has also introduced the concept of a PIP or Performance Improvement Potential. The PIP is a mathematical indicator of the potential for eliminating any differential in the performance of high and low performers. The PIP is also a useful decision aid in determining where to allocate often limited resources to achieve the greatest rate of return. Gilbert also discusses the "stakes" or value of improving the performance. That is, even though there is great potential for improving performance, it may not be worth the time, money, and effort required.

ORGANIZATION DEVELOPMENT MODELS

Assumptions

Application of systematic development procedures is not as advanced at the organization level as the other levels reported in this paper. While much has been written about organization development, the activities described often do not indicate systematic analysis, design, development, and evaluation. Rather, this literature is generally focused on how to change the structure of organizations with limited reference to instruction and personnel. One view, made popular by Gaff (1975), is that organizational development, faculty development, and instructional development are three distinctly different types of activities. Abedor and Sachs (1978) elaborated on this concept and proposed activities and evaluation criteria for each category.

In contrast to Gaff's "separate elements" perspective are development models which attempt to integrate all elements into a single system. This latter position holds that all three are part of a single system and must be considered together. The position taken is that separating the system into sub-components along artificial boundaries hides important characteristics and relationships. A common label for this integrating concept is Human Resource Development. This more comprehensive view of organization development was employed to select models for review in the present paper. Two models of organization development, one by Blondin and the other by Blake and Mouton, are reviewed.

Blondin Model

Blondin's organization development model (1977) provides the philosophic and structural framework for the Southeast Asia Instructional Development Institute (SAIDI). The Institute, located in Manila in the Philippines, is dedicated to improving the welfare of all the peoples of Southeast Asia. Her model serves as a guide for the many development services SAIDI provides to a variety of organizations, as well as the basis for a graduate program in instructional development.

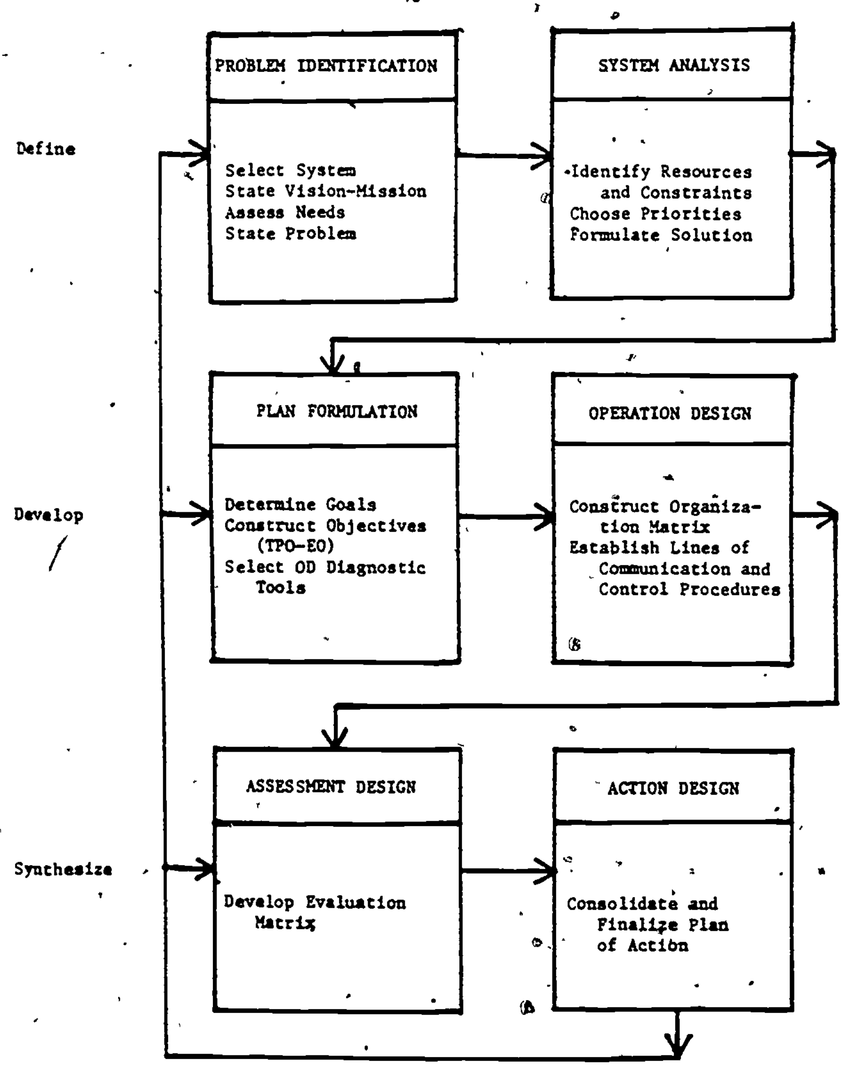

Figure 12. SAIDI assessment decision-making model. (by Jacqueline Blondin.)

The model has three stages: define, develop, and synthesize. Each stage has two steps and each step has one or more sub-steps. The SAIDI model is in part derived from the Instructional Development Institute (IDI) model reviewed earlier. Blondin has taken many of the IDI's steps and incorporated them into a more comprehensive view of the organization as the system for development.

In the defining stage, the first step is problem identification. Its sub-steps are to select the system for development, state the vision or mission of that system, conduct a needs assessment, and state the problem. The second step is to perform a system analysis. This includes identifying human, physical, and financial resources and assessing the desire of affected personnel to proceed. Constraints are also assessed and tested for their validity. Priorities are established among various areas of need, and tentative solutions are formulated.

Stage two—develop—begins with formulation of a plan, which includes determining goals for each element of the tentative solution as well as project objectives to measure progress toward the goals. Project objectives are an important part of the model and distinguish it from many development models which only require specification of learner objectives. In fact, the model does not assume that instruction is necessary to move toward solving the original problem. In the Blondin model, learner objectives are stated during formulation of the plan, but only if instruction will be part of the overall plan. Organization development diagnostic tools are also selected during formulation of the plan. Examples of such tools are action research, brainstorming, norm modification, force-field analysis, conflict resolution, surveying and developing the communication network, and training. The reader should note that training is only one of a variety of tools available to the user of this model.

Step four--operation design--begins with construction of an organization matrix. The matrix displays line relationships, function relationships, and role descriptions of all relevant personnel in the organization. Lines of communication and control procedures are then established in preparation for implementing the plan. The emphasis on planning for installation and concern for communication serve to emphasize the organization development orientation of her model. Clearly, the intent is to achieve a lasting change and create an environment in which continued development is more likely to occur.

Stage three has two steps, assessment design and action design. Assessment design specifies the development of an evaluation matrix to measure both intended and unintended outcomes. Formative evaluation plans are also developed at this time. A three-part structure is suggested for structuring the evaluation and collecting data on both processes and outcomes. One unique feature of her evaluation plan is estimating the value of expanding the effort to a larger or different organization. Also of interest to developers is the requirement that evaluation results be supplied to both project staff and key decision makers in the organization. Most models of the development process imply (by omission) that evaluation data should not be distributed outside the development team. By specifying external distribution of findings, Blondin hopes to create an open, honest environment where success and failure are visible, and both are understood to be part of the development process.

The last step is to design an action plan for implementing the proposed solution and assessment plan. Timelines are developed, commitments again obtained, operational personnel trained, and the necessary materials produced and distributed. With all elements defined, the plan is then implemented and assessed. Given the formative evaluation orientation of much of the assessment, it is expected that on-line modifications will be made as necessary to assure progress toward stated goals.

The major strength of Blondin's model is its recognition of the many organization elements which affect attempts to bring about change. Its focus on development which will build an organization committed to and able to carry out additional development makes this model noteworthy. Its greatest limitation is the lack of specific information on how each step is to be performed. Some steps (evaluation, objectives, and action design planning) are well specified, while others require developers to rely on their own judgement as to what should be done.

Blake and Mouton Model

The second model selected for review is by Blake and Mouton (1971). Although it is a model of organization development (OD) which subsumes ID as one of several activities directed toward improving an organization, this OD model does have a systems orientation, and it is similar to a number of other models. The reader

Specification	Description
(1) An ideal systematic model is drawn up which describes what should be at a designated time.	The model is based on theory, fact, and logic, uncontaminated by assumptions from the status quo culture or from the past.
(2) An objective appraisal is made of the situation, or what is.	The actual or as is situation is described in a way that permits point-by-point comparison of actual circumstances and those that would exist if the ideal model were implemented.
(3) Gaps and discrepancies appear between the is and the should be, the actual and the ideal.	The gaps become motivational forces; the actual is analyzed for its strengths and weaknesses; motivation to close the gaps directs change; conditions to be rejected or replaced are identified; development steps are planned and programmed.
(4) The ideal model includes all relevant identifiable forces.	Those forces under direct organizational control and those emanating from the environment are included.
(5) Steering, correction, and control mechanisms guide conversion from actual to ideal.	The situation is measured before change is initiated, at intervals, and when change is completed for facts for guiding further action.

Figure 13. (From OD—Fad or Fundamental by Robert Blake and Jane S. Mouton. Reproduced by special permission from the January, 1970 TRAINING AND DEVELOPMENT JOURNAL. Copyright 1970 by the American Society for Training and Development, Inc.)

is cautioned that the model discussed here is their OD model and not related to their widely known management style matrix.

Blake and Mouton's general model for systematic development is relatively simple, containing only five specifications. They are: (1) an ideal model is constructed of what should be; (2) an objective appraisal is made of what is; (3) gaps and discrepancies are identified between the ideal and actual; (4) the ideal includes all relevant identifiable forces; and (5) steering, correction, and control mechanisms guide conversion from actual to ideal. Unlike most authors, Blake and Mouton do not present a graphic flow chart to display their view of the development process. However, their step by step flow of events is reproduced below. It is interesting to note that Blake and Mouton are among the very few authors who state their assumptions before presenting their model. While all authors make numerous assumptions, few have made the effort to make them visible.

Blake and Mouton make eight assumptions about change which are integral to their model. The first assumption centers around the concepts of: (1) individual development, (2) membership development, and (3) organization development. Their view is that all three are interrelated and must be addressed as part of a total system of development. Their second assumption is that, although change can occur through revolution or evolution, the most effective and efficient means is by systematic development. Unfortunately, they present little hard evidence to support this assumption.

The third assumption is that human behavior and organization operations interact to either facilitate or inhibit performance. Thus, both must be addressed by the developer. The fourth assumption is that education and training must be interwoven to produce effective development. They express the concern that organization development is often limited to training (defined as mastery of skills without understanding underlying principles) to the detriment of long-term career development of employees.

Assumption five deals with the relationship between thinking and emotion. They decry the tendency to perceive thinking and emotion as separable and the existence of two camps of developers. One camp limits itself to rational thought as the focus of development while the other deals with how people feel about themselves, other people, and the organization. Blake and Mouton believe that both the rational thought and emotions of people must be included in any comprehensive development effort.

Assumption six deals with the relationship between boss and subordinate. They assume that one goal of OD is to create a climate of candor and openness that facilitates communication. They point out that boss-subordinate personal relationships are inherently different from, for example, husband-wife personal relationships, and hence only a subset of all possible human relationships is relevant to OD efforts. They caution developers to limit their concern to the person-to-person relationship elements relevant in an organization setting and leave the personal inner values of the learner alone.

Their seventh assumption deals with the need for creating an internal initiative for engaging in development. Their view is that outside consultants are usually not effective in bringing about lasting change. Outside consultants are viewed as usually wanting to avoid giving direct advice. This results in the consultant being perceived by the client as not making any contribution. On the other hand, the consultant feels if he/she gives too much advice, the client becomes dependent and the likelihood of creating a continuously renewing organization is diminished. (Developers would do well to examine this paradox whatever the setting of their development activities.)

The eighth and last assumption of the Blake and Mouton model is that human beings have a basic behavioral drive to achieve involvement and participation in decisions and actions which affect them. This is in contrast to the authority-obedience view held by many managers and administrators. It is assumed that solutions to organization problems should always be sought in the context of greater involvement and participation by those affected.

In summary then, while the Blake and Mouton model has only five steps, it has eight underlying assumptions which structure its application. The major strength of this model is the high visibility given to its underlying values and assumptions. Any user of this model should be well aware of its philosophy and assumptions concerning the nature of human beings. No other model reviewed in this paper can make that claim. Its major limitation is the lack of prescriptive procedures for utilizing the model. Being aware of the five steps and eight assumptions provides little operational assistance to the developer wishing to engage in the development at the organization level.

The comprehensive view of the total organization including personnel, facilities, rewards, and information networks represents systems analysis and instructional development on the largest scale yet applied. Unfortunately, the number of models available to illustrate this level of application is very limited. Likewise, the models are generally not well documented or validated.

SUMMARY

This review of typical ID models may leave the reader unsure of how to react to such a wide variety of models. Obviously, the literature is replete with models, each claiming to be unique and desiring of attention. However, while there are literally hundreds of models, there are only a few major distinctions. Many of the models are simply re-statements of earlier models by other authors using somewhat different terminology. Also, there is a disturbingly small volume of literature describing any testing of these many models. While no one can be certain, it appears that well over half the ID models have never actually been tested. And, of the remainder, many have been used only once. It appears that many active developers simply do not write for publication, while many writers simply don't do much development.

Being fair to the authors of the models, most are more interested in developing instruction than in scientifically validating their development models. The typical publication containing an ID model simply describes its major steps or stages and perhaps how they are to be performed. The author(s) usually assumes the model is worthwhile and presents no data to substantiate that position. In a few situations, a case study of an actual development project is presented along with the model, but even this low level of validation is relatively uncommon.

It can only be hoped that in the future some ID models will be subjected to rigorous scientific validation. Such validation would require precise description of the elements of the model followed by systematic data collection concerning those elements. The investigator would also need to be alert to possible discrepant data not accounted for in the model. Repeated trials under such conditions would, if the model had any validity, result in a precise set of findings regarding the conditions under which the model was valid. No respected scientist would expect a single model to be valid under all conditions, but authors of ID models are usually silent on this matter. It is safe to say none of the models currently available in the literature has been subjected to such rigorous scrutiny. In fact, most authors completely ignore the issue of what conditions should be present if one plans to use their model. For a more complete discussion of procedures for validating a model, the reader is referred to an excellent chapter on models and modeling by Rubenstein (1975).

What then, is the response of the responsible professional to the plethora of unvalidated ID models? This author would suggest that developers acquire a working knowledge of a few models representing a variety of types of development. Then, as new and different models are encountered, they can be compared to those with which one is familiar. If a client brings a model to a development project, it is probably better to use it (modified if absolutely required) rather than force the client to adopt your favorite model. Another suggestion is to have available in your repertoire some of the models which can be presented with varying levels of detail. This will provide an easy introduction which can later be made more detailed as development progresses. Also, when facing a range of situations, developers should be in the position of selecting an appropriate model rather than forcing the situation to fit the model. As Maslow has commented, "If the only tool you have is a hammer, you tend to treat everything like a nail." Developers should have a number of tools in their tool bags and use the right tool for the right job.

FINDING MODELS IN ERIC

ID models are like mushrooms; they appear in all manner of strange locations, not to mention shapes, sizes, and degrees of toxicity. However, the reader may be interested in how models tend to be classified in ERIC. This information will be of value in searching ERIC or other databases for publications regarding ID models.

Below are the results of an interactive computer search conducted in March of 1980.

From many possible descriptors the following were initially selected: instructional development, instructional design models, systems approach, materials development, curriculum development, instructional systems, and systems development.

A variety of two-way and three-way combinations were queried requiring either major and/or minor emphasis. Without presenting all the results, it is correct to state that most queries resulted in a very large number of false drops.

The only combinations that resulted in a reasonable number of hits are as follows:

"instructional development" and "models"	33 drops
"instructional design" (major) and "models"	186 drops
"models" (major) and "instructional systems"	45 drops
TOTAL	264 drops

A non-duplicate printout of these three sets yielded 245 documents. Inspection of the printout yielded 51 which could reasonably be considered as on target. This latter list was further reduced to 20 titles for inclusion in the attached annotated bibliography.

It is important to note that the term instructional development was only recently added as an ERIC descriptor. Hence, it will likely prove to be a more productive descriptor as new titles are added to the database.

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Branson, Robert K. Interservice procedures for instructional systems development: Executive summary and model. Tallahassee, FL:

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