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From the Editor

JID is unique in the sense that it attempts to serve all of the many people involved in the field of instructional development: practitioners, researchers, and theoreticians. They work in business and industry, higher education, K-12 schools, government, and professional education.

With an audience this diverse, it is obvious that different segments of the audience have different needs and wants—and therefore different expectations for JID. An article one portion of the readership finds useful may not appeal to another group of readers. JID has attempted to meet these varying expectations by including theoretical, practical, and research articles in each issue.

Feedback from readers and from those who have dropped their JID subscriptions indicates, however, that the journal has not been practical enough. Readers seem to want more "useful, on-the-job" articles. They are clear, however, that they want this practicality without sacrificing JID's high standards.

Judging from these formative evaluation data, JID's past attempts to include "useful" articles have apparently not been as extensive as many readers need and/or want.

JID will, therefore, attempt to include more such articles. The two articles in this issue that discuss heuristics of ID, the four articles about ID models used in different settings, and the article on implications of cognitive psychology for ID all present sound theoretical information translated into usable ideas.

The degree of "practicality" of future issues, however, depends mostly on you. JID can print articles only if we receive manuscripts. All of you, as readers, are also prospective authors.

We realize that many readers, especially those in business and industry and those in K-12 schools, are not rewarded on their jobs for writing and publishing. However, in order for us to carry articles related to your needs, someone who is familiar with, and works in, your setting must write those articles. We are relying on you for submissions and look forward to receiving your manuscripts.

—K.H.S.
Further Consideration of Heuristic Guidelines for Multiple Institution Instructional Development Projects

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Abstract. This article elaborates on some of the heuristic dimensions of instructional development put forth by Haney, Lange, and Barson in the late sixties. In addition, several new heuristic guidelines are presented and more recent articles on heuristic guidelines are discussed. These new guidelines provide additional commonsense approaches to instructional development (ID) which the authors discovered while working on a series of interinstitutional instructional development projects. The old and new heuristic approaches are based on first hand experience in the field. Some of the new guidelines are specific to multiple institution ID projects. Others have applicability for any type of ID project.

Over a decade ago, AV Communication Review published a classic article by Haney, Lange, and Barson (1968): "The Heuristic Dimension of Instructional Development." Eighteen heuristics appeared in that article, many of which are still applicable today. Since then Forman and Richardson (1977) and Durzo (1978) have added to the list. Forman and Richardson described problems inherent in a multi-institution instructional development project and offered helpful suggestions and caveats for large-scale projects. Durzo provided a more general set of guidelines for instructional development programs in higher education based on an extensive review of the literature.

For those working in the area of instructional development, the heuristic guidelines set forth in these three articles continue to be a set of "strategies, tactics, gambits, and ploys" which the instructional developer can use with reasonable confidence. This article attempts to clarify and elaborate on some of these heuristics and identifies additional ones which are particularly pertinent to multi-institution instructional development projects.

The conclusions drawn by the authors of this work are the result of 2 years of observations made while participating in a large instructional development program with the Ohio Regional Medical Audio-Visual Consortium (ORMAC). This consortium of the seven Ohio medical colleges was funded by the National Library of Medicine to investigate the feasibility of producing and evaluating self-instructional materials when multiple institutions are involved in the instructional development process (Contract No. 1-LM-6-4715). The authors participated in the development of seven instructional packages which were developed and field-tested for the seven medical schools in Ohio. Each package was developed using a standard instructional development model; each required about 60 minutes of student time to complete. The authors coordinated the development of three of these packages and participated in the development of the other four. The medical schools at Case Western Reserve University, Ohio State University, Toledo University, and the University of Cincinnati housed the production centers. Faculty and developers from the medical schools of Ohio University, Wright State University, and the Northeastern Ohio Universities also participated in the development and field testing of the packages. Nearly 50 content experts (faculty members) participated in the project.

Continued on p. 8.

EDITOR'S NOTE

When IJD received the manuscript by Hoban, Heider, and Stoner, we were glad that someone had decided to update and expand the classic list of heuristics presented by Haney, Lange, and Barson ("The Heuristic Dimension of Instructional Development," AV Communication Review, 1968, Vol. 16, No. 4, pp. 358-371).

Because the Haney, Lange, and Barson article was 12 years old, because it appeared in a different journal, and because many of our readers might never have read it or might have forgotten it, reviewers suggested that IJD reprint the original article as a companion piece to Hoban's.

IJD saw this as an excellent chance to let our readers see a classic ID article. It is as valid today as it was when it first appeared and still provides many concrete and practical suggestions about conducting instructional development.

We hope you will find useful the following juxtaposition of the two articles. If you would like to see other "classic" ID articles reprinted in IJD, please let the editor know.
The Heuristic Dimension of Instructional Development

JOHN B. HANEY
PHIL C. LANGE
JOHN BARSON

At the conclusion of a research project, the investigators face two questions: "What have we found?" and "What have we learned?" The answer to the first is determined by an examination of the data, the answer to the second, by a reflection upon their experiences. Contribution to knowledge from research can result from both systematic inquiry and heuristic observation.

The answers to these two questions can be stated with different kinds, as well as degrees, of confidence. From the standpoint of systematic inquiry, confidence is an abstraction—a level at which one may declare data to be statistically significant. From the standpoint of heuristic observation, confidence is a conviction that something is true, that it will work, that one can use it with assurance.

BACKGROUND

This paper reports the heuristic observations of members of the evaluation team and the principal investigator of a two-year study of instructional development in four major institutions of higher education across the country, Instructional Systems Development: A Demonstration and Evaluation Project (OE 3-16-025). In brief, the study was a project in which a hypothetical model (see Figure 1) for the systematic development of college-level courses was tried out at Syracuse University, Michigan State University, the University of Colorado, and San Francisco State College. This four-institution demonstration project was an extension of an earlier study, A Procedural and Cost Analysis Study of Media in Instructional Systems Development (OE 3-16-030), which sought a means for applying systems procedures to instructional development in higher education. The findings of this prior study offered hypothetical and logical bases for instructional development steps, but did not provide much assurance that they were practical.

During the conduct of the project, transcriptions were made of conferences among the members of the development teams and the teaching faculty. This record preserved the questions, interactions, observations, and agreements of the media specialists, instruction specialists, and evaluation specialists as they related the steps of the hypothetical model to the task of developing courses of instruction with real faculty and students in actual university environments. The development teams did more than test and revise the model in terms of procedural steps and information flow. They learned how to use the model in order to get the desired results in terms of instructional effectiveness and efficiency. Along with the what, represented by a labeled step in the model, there emerged a heretofore uncharted how, being a collection of strategies, tactics, gambits, and ploys to make the model work.

When this article was published, John B. Haney was Director of the Office of Instructional Resources, University of Illinois, Chicago Circle; Phil C. Lange was coordinator of Student Teaching and Preserve Programs at Teachers College, Columbia University; and John Barson was director of the Office of Institute Programs at Michigan State University. Together with John M. Gordon of the Teaching Research Division of the Oregon System of Higher Education, Drs. Haney and Lange were members of the evaluation team for the Instructional Systems Development Project, of which Dr. Barson was the director.

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These are the heuristics of instructional development. They are what has been learned by successive discovery—action research to guide future action. Heuristics are the mark of experience, not conflicting with formal preparation in theory and methodology, but somehow apart from it. Often intuitively felt, heuristics are sometimes articulated and passed in oral tradition, as rules of thumb, from one academic generation to another.

In various fields and manners, heuristics may appear as principles, aphorisms, dogmas, or maxims. In one sense, a principle is a polished heuristic. The Prussian militarist Von Clausewitz reflected upon his experiences in war and formulated a matched set of concepts: "surprise," "concentration of force," and others still valid, despite technological change. Historian Charles Beard summed up what he learned in life with a series of aphorisms, like "Who win the gods would destroy, they first make mad with power." Professional football coach Vince Lombardi spouts dogmas, such as "Wining isn’t everything; it is the only thing." Young activists wear buttons with their guiding motto, "Don’t trust anybody over thirty."

A distinction may be made between the rules of the game and a player’s heuristics. The rules are stated; they are how the game is played; the heuristics are acquired; they are how the game is won. As Robert H. Davis points out, "Nobody plays chess following a model; he would get clobbered!" But in the period between the opening and closing formal moves, the player is guided by such heuristics as "Control the center of the board," or "Develop each piece to the maximum."

An articulated heuristic may seem like the poor cousin of the stated hypothesis of empirical research, but more likely it is in its favor. John M. Gordon calls a hypothesis a "past heuristic," for which research is most profitable to the extent that the heuristic is true.

Collecting heuristics is not academically respectable. They are not subject to proper experimental design, but they are daily put to the test. While admittedly obvious, they are useful because they are so often ignored. While admittedly overgeneralized, they are nevertheless generally true. What they lack in rigor, they make up in vigor. For example, no accreditable research backed up Dale Carnegie’s heuristic statement of the Twenties ("Remember that a man’s name is to him the sweetest and most important sound in the English language"), but one has confidence that they can be genuinely useful in winning friends and influencing people.

Heuristics are usually stated strongly in a style that avoids the passivity and qualification endemic to scholarly writing. They address themselves to the reader or listener in the second person, thereby implying that you should act consistent with the guidelines, i.e., “You can lead a (satisfied) horse to water but you can’t (usually) make him drink (much).”

In the case of instructional development, the heuristics set forth below act as unifying elements to tie together and make workable the discrete steps of the hypothetical model. The supporting examples are drawn from the experiences of the persons associated with the USOE project. The 18 heuristics are extensive in their coverage of practical aspects of the work of the media or instructional development specialists in higher education, but are not intended to be comprehensive or definitive. The reader is expected to assume the role of such a specialist, whose overall purpose is to help faculty members improve their instruction.

HEURISTIC #1:
Always move toward determining the professor’s objectives. The developmental model is explicit in the logical place to start the statement of behavioral objectives. But when you sit down with a professor and try to get him to do this, he is likely either to go away and not return, or say outright, “I’ll be damned if I spend my time writing behavioral objectives!” You need some techniques to get at this task indirectly. When a professor says that he wants to “what his students’ curiosity,” you may reply, “All right, suppose you have a student whose curiosity is whetted. What does he do?” “What does an ‘A’ student do that an ‘C’ student doesn’t?” The professor will often respond by describing student behavior. Or you can employ what the late Eugene Oxtander called the “observation-verification” approach, i.e., “Let’s see your exams. Let’s observe what’s going on in the classroom.” Then deduce and articulate what the apparent objectives are, stating them in behavioral terms, and see if the professor agrees. These are both ways of moving towards the objectives without bringing the process to a halt if the professor will not initially get at this task himself.

HEURISTIC #2:
The development of software is dearer than the acquisition of hardware. Hardware equipment, with lights and knobs and display tubes and keyboards, has a great fascination, and there is temptation to devote to it a disproportionate share of energy and money. Sometimes when asked about the progress of instructional technology at his institution, a media person may reply, “Well, we’re beginning our installation of the gear, and—oh, yes—we’re having a two-week workshop for the instructors to prepare the materials for the coming year!” Programmed instruction people some years ago had a rule-of-thumb: thirty hours of development time to one hour of student time on the program. In the case of computer-assisted instruction, the figure has been raised to 400 hours of development time to one student hour at the console. And it is in software development and utilization that the employment of hardware succeeds or fails.

HEURISTIC #3:
The development of software is a continuous process. In some areas of endeavor, you can “do” something and have done with it. Not in instructional development. The production of validated materials involves a series of successive approximations. And then when you are able to demonstrate that your materials can achieve your objectives, you are likely to move to objectives in a higher domain. This process is more than ordinary evaluation and revision; it involves a commitment to continuous refinement and improvement.

HEURISTIC #4:
Involves the student in the developmental process. Often educators will attempt to evaluate instructional materials by saying, “I think....” Though the evaluator may be an accomplished and experienced teacher, this statement is still in the realm of speculation. The student is the prime source of information about the effectiveness of instructional materials in achieving their objectives. Often significant revisions of materials can be obtained by having a single student work
through them and discuss the experience with the developer. Avoid the temptation of having a professor go off by himself for a summer and prepare final versions of instructional materials without any students around.

HEURISTIC 

The model for instructional systems development is universal in any general way. At the start of the demonstration and evaluation project, it was thought that the 25-step developmental model could be tested and revised to produce a universal model. Indeed, each of the four institutions produced its own variation.

It might be said that people never adopt a process, they adapt it. But there are some general similarities in all the instructional development models set forth for the systems approach to education. These models are all product oriented, designed to produce gains in student learning. They pinpoint and sequence interdependent functions. They have feedback loops to assure adequate performance, and they contain similar functional clusters.

The value of a model is to rationalize procedures. It reveals relevancy of otherwise discrete activities. Robert E. deKieffer points out that the model can be used as a road map so that whenever you deal with an instructor, you can tell where you are. Also, you can tell what steps ideally you should have gone through to arrive at that particular point so that you can "scoop back" and find out about prior decisions and other pertinent inputs before proceeding further.

HEURISTIC 3

Stress the human elements in an instructional system. People generally have a stereotype about systems and technology, based upon systems analysis and applications in industry and the military. A proper instructional system allows for the human use of human beings. Harold Barlow defines technology as "an ensemble of practices by which available resources are used to achieve values." It is important to stress that your objective is the enhancement of human values as much as a favorable cost/benefit ratio. And there are distinctive roles and functions for humans in instructional systems.

At first glance, the instructional development model appears to demean the professor. It places greater emphasis on learner involvement. It requires inputs from other specialists and involves mediation of instruction. It extends his instruction and forces him to reveal his preteaching decisions. But on the other hand, the professor has more attention paid to him, for things happen when he makes a decision. He is credited with being an innovator. So it is well to stress the human elements in an instructional system, especially for the students and professors involved.

HEURISTIC 4

Proceed on the basis of agreements. When working with multiple-section, multiple-instructor courses, it is important to get agreements as far as possible on procedures, criteria, objectives, and grading instruments. There is a tendency to avoid tackling these issues directly, for agreement implies approval, and in committee situations precise agreement is impossible. Often it is sufficient to delineate the range (the maximum and the minimum) of acceptability, which is in effect an agreement to disagree within specified limits. With a failure to specify such limits, the course will drift from week to week, compounding uncertainty and uncontrolled variables. For example, in a large freshman composition course, an assigned exercise in the logical support of a central thesis might be graded by an instructor who is primarily concerned with the student's ability to "think," and so rewards expression of "great ideas" regardless of evidence of logical support, while another instructor emphasizes rhetorical form or pattern, and so rewards inclusion of proper kinds of support of even trivial ideas. All instructors should understand how they will handle assignments of this nature, at least for this time around (assuming a recurring course), and should commit themselves to following through on these agreements.

HEURISTIC 5

Don't let the words get in the way. Like most fields, instructional development has its own jargon. The point to consider here is the use of this jargon on members of the teaching faculty. An instructional development specialist using the term "information input overload," stemming from experiences in the computer field, may find that a humanities professor has turned him off. James Popham's popular wall motto, "Help Stamp Out Non-Behavioral Objectives," may please the office occupant but arouse negative responses in faculty members during initial contacts. It is better to compromise and use a more positive approach through the more neutral specific objectives, defining them in behavioral terms.

Not only word choice, but manner of speaking can interfere with getting the desired faculty responses. Faculty members are usually not disposed to accept dogmatic statements from persons outside their own fields. Many a faculty member sincerely believes that he can look at a class and by an "eye-ball indication" tell whether the students understand what he is talking about. To tell him flatly that this is a delusion is to cut yourself off from further, possibly productive, association.

HEURISTIC 6

Seek out the dirty jobs. Media specialists naturally would like to be called upon immediately to sit on the highest councils of departmental course planning, but if you wait for that kind of call you'll spend most of your time staring at the telephone. John E. Dietrich suggests that such time is better spent in finding out what kind of jobs departments are anxious to have done but do not want to do; then move in and help them out. Physical preparation of examinations is one area; scoring is another. Handling convention and conference support, preparing graduate study brochures, and providing artwork for research reports are others. Be superbly responsive and proficient. Such contact gives the media specialist and instruction specialist an opportunity to meet faculty and work indirectly towards the goal of instructional development. Don't try to sell an idea too hard to a faculty member. Your contact in routine work will provide an opportunity to structure the conditions so that the faculty member will begin seedling ideas for himself. Because he is familiar with you and trusts your operation, he will seek your cooperation and support in implanting and maturing an instructional idea.
HEURISTIC #10
Learn the professor first. The students taking a course do this; so should the instructional development team. The faculty member is indispensable to instructional development in the university environment, and you should regard him as a human being, not just a functionary in the role of subject matter expert. There is often a vital distinction between his expressed needs and his real needs. One on-camera television teacher in the project made such exciting and exasperating demands on the assigned graphic artist that it became apparent that his need was more for media therapy than for supporting visual materials, and the relationship could be characterized as patient-nurse rather than professor-artist. Before engaging in a major development effort with a professor, find out whether or not he has the academic respect of his colleagues in his department and has a history of following through to completion projects enthusiastically begun. Often a trip to another university where some innovative program is operational will give you an opportunity to learn the professor’s special interests, concerns, biases, prides, fears, and pleasures.

HEURISTIC #11
See that faculty members are rewarded for work in instructional development. The normal academic reward system is stacked against a professor who spends the required long hours and energy developing validated course instructional materials. However, most universities have a stated policy of taking good teaching into account in decisions for promotion, tenure, and salary increases. One reason publication generally dominates the selection for these rewards is that publication is visible, quantitative, and qualitative. In that referees pass judgment on the professor’s research and writing prior to publication, and the whole academic world can acclaim or discredit it subsequently. Teaching, on the other hand, traditionally occurs in the sealed chambers of the self-contained classroom, and information about it transpires with uncertainty and distortion. The instructional developer is on solid ground when he establishes that the production of validated instructional materials is similarly visible, quantitative, and qualitative.

In addition, professors can find avenues open to publication in prestige journals for reports of the design and data from instructional development, if their approach is comparable rigorous to conventional research, and the writing avoids the pitfalls of the common “How I Taught Freshmen Psychology on TV” type of article. Further, arrangements for commercial distribution of developed materials can provide financial rewards for both professor and institution.

HEURISTIC #12
Structure the conditions for survivability. Instructional development projects have a high mortality. What is begun with high expectation and energy often runs down after a year or two and passes out of existence. Ironically it takes about this long for publicity about an innovative project to circulate, and so by the time visitors arrive in numbers, many times all they can see are closets of stalled equipment. Attention must be given to building a staff that can continue the work and supply renewed ideas and energy when the original major professor turns his attention to other things. Often, pilot or experimental projects have a basis in special funding that is difficult to transfer to the regular budget. Institutional budgeting on a program basis, rather than the common “departmental pot” basis, can facilitate this transfer. Of course, if a new instructional development is evaluated for its balance of costs and benefits and if it obviously cannot feasibly be brought up to acceptable standards, it should be phased out. But the point to stress here is that this action should be a deliberate decision, not the result of dissipation or default.

HEURISTIC #13
Structure the conditions for transferability. Often it is not as hard to develop instructional materials in one university as it is to get them used in other universities. The N-I-H (“Not Invented Here”) syndrome is very real. Institutions that will accept transfer credit for a student who has taken a course at another institution are loath to accept on their campus the instructional materials and teaching system that were the essence of that course. The feeling is that it is necessary to start from scratch and develop new printed materials, new tapes, kinescopes, instruction kits, and organization from local resources.

Ideally and eventually, collegiate instruction should be more cooperative, coordinated, compatible, efficient, and intercollegiate. What is immediately needed is a way of assembling the painstakingly developed supporting materials, objectives, teaching examples, and demonstrations in a “smorgasbord” fashion so that a development team at another institution can examine, select, arrange, adapt, combine, and put the local label on a final course package.

But a word of caution. When the materials themselves or some facets of instructional development are being viewed as transferable or up for adoption, they are often too readily or improperly transferred. As Philip W. Teymann has observed, the popularity of an audio-tutorial laboratory method of instruction has led some educators to transfer the idea of individual learning stations and the more obvious physical characteristics without fully understanding the philosophical foundation for the audio-tutorial system. The trappings or visible artifacts of the system—the open lab with carrels and audiotape recorders—are wrenched away from the ingredients of the system: its commitment to student learning based upon the characteristics of the individual learner and the systematic relationships between objectives, learning activities, and continuous evaluation. If the instructors have not integrated the new method into the course, if students do not see the relevance or value of their lab activities and small group sessions, and if the grades and marks in the course are based in the usual way on textbook passages, such “transfer” or “adoption” merely sets the stage for educational disaster.

Thus those who wish to transfer or adopt instructional packages must be reminded that it’s not just a matter of bringing home a new baby. There is also the commitment to the process, nurture, and continuous development—as underscored in Heuristics #2, #3, etc. Moreover, those who generate good ideas for adoption need to present them for adoption in such manner as to assure good homes for their development.

HEURISTIC #14
Don’t let subject matter interfere with an understanding of process. The instructional development specialist needs to have
techniques to get faculty to consider a new teaching device. For example, if you want to introduce an English instructor to the possibilities of programmed instruction, the apparently natural step would be to show him a program on grammar or punctuation. Don’t do it! He will fight the first frame of the subject matter. Show him a program on contract law. Let him read some frames and make choices as to whether some capsule case contains all of the conditions for a valid contract. In this way he will learn how the process works without getting embroiled in content controversy. And show the law professor the program on punctuation.

Then, after the new process or device itself is understood, your faculty member has an informed basis for imagining and considering its various applications to his subject-matter specialty. Once he is favorably disposed in general toward its possible applications, he is ready to consider constructively specific illustrations in his own field. This is the time to introduce specialized examples—when he wants to build on them.

HEURISTIC #3

When you abstract reality you also reduce the learning experience. As you move the learning situation away from the real thing, you cannot assume that the students have learned the real thing. An aircraft simulator is not an aircraft; the available punishments for simulator error do not compare with those of actual flying, and so the nature of the experience is different. If music or public speaking students aim to perform before audiences, practice sessions before an instructor or classmates do not provide sufficient tests of accomplishment: somehow the instructional system must introduce the presence of an audience. Simulation may move the learner farther along than lectures and readings, but don’t assume that you achieve more through simulation than is actually the case.

The point of this heuristic is not the insufficiency of simulation, but the necessity to bring the student from simulation to actuality as part of the structured learning activities. The heuristic holds also for mediated instruction. No one expects a student to master a foreign language entirely in a language laboratory. Samuel N. Fostlethwait stresses that his purpose in audio-tutorial botany is not to bring the students to audiotapes or film loops, but to get the students to better deal directly with plants. Whenever the student encounters simulated or mediated instruction, he should be made to appreciate the reality that cannot be brought into the classroom.

HEURISTIC #6

Find the pattern or format that will balance benefits and liabilities. In a variation of the Marshall McLuhan observation about the old medium being the content of the new, there is a tendency to use instructional media to store and distribute old patterns of instruction. In an introductory course in business administration, you might invite a business leader to address a class and videotape his remarks for subsequent presentations. The result will almost invariably be the reading of a public relations speech. Instead, the TV interview format can be used to strip the guest of his PR armor and get him to focus directly on the issues that relate to the content of the course, providing opinion and examples to demonstrate the dynamics and values of the world of business. Then, afterwards, the interview can be reviewed and an introduction inserted at the beginning to set the stage and prepare the student for the lesson. A summary can be added at the conclusion to review the salient points and lead into follow-up class discussion. This kind of pattern makes effective use of the capabilities of the medium in terms of the nature of the objectives and content of the course.

HEURISTIC #7

Faculty members are not generally moved to change their behavior by reading reports of instructional research. An instructional developer has on hand enough research reports so that if he were to stack them one on top of the other, he could diminutively replicate the Washington monument, with the crowning beacon being his own dissertation. But when a young researcher tells a tenured professor about an elegantly designed and rigorously controlled study that “failed to disprove the null hypothesis,” he is likely to get the reply, “Son, you haven’t told me a damn thing!” Findings of no significant difference produce no significant deference. Such reports may help to prop up a cooperative professor who has misgivings, or to counter certain negative attitudes among students and administrators. But the point to remember is that a professor or student or administrator will accept a change when it produces a perceived net gain from his own point of view and on his own terms. The task of the instructional developer is to find out what that might be and bring it about.

HEURISTIC #8

Nothing persuades like a visit, but watch out! Nothing deflates like a deluded visitor. The four-university project from which these heuristics emerged is cognizant of the advice of H. M. Brickell, “Nothing persuades like a visit.” Surely it is of great benefit for a development team to let professors see an innovation and different human models in action and talk directly with respected disciplinary counterparts at another institution.

But sometimes publicity about a particular operation or activity raises expectations higher than can be supported by actuality. The seasoned campus visitor not only takes the guided tour of production facilities, but also talks with the instructors and observes students engaged in the reception and application activities of the instructional system. A multimedia classroom with student response stations may turn out to have only a demonstration program to utilize it. Computer-assisted instructional facilities may have only trivial games to play. Before taking a professor to see these, make sure that by their merit and not their publicity they will be persuasive.

And in the case of your own innovations in instructional development, recognize that you may be poorly prepared, staffed, and organized for visitors. Your main purpose was to improve instruction for your own faculty and their students. Don’t dilute quality on this front with unjustified ineffective show-and-tell efforts for visiting firemen. Some development stories are too real, too complex, and too private to be seen; they are better told by media other than the visit. Moreover, well-run, demonstration-visitaton projects do themselves call for their own instructional development program to be effective for the visiting audience.
Heuristic Guidelines
Continued from p. 2.

different content areas provided the framework for the packages. The instructional development coordinators for each package met about eight times during the 2 years to exchange ideas, identify common problems, and critique the instructional packages in various stages of development.

The following perspective on heuristic guidelines, then, is the result of the authors' hard-won experience on the ORMAC projects.

Create the Conditions for Adoption

ORMAC was concerned that the materials, expensive to produce, would be widely adopted. Therefore, great care was taken in structuring conditions of transferability as had been recommended by Durzo (1978) and Haney, Lange, and Barson (1968). One of the project's assumptions was that instructional materials developed by faculty members from multiple institutions would have maximum adoption since faculty at each medical school would have part ownership of them and ownership encourages usage.

To further increase the likelihood of adoption, the materials were designed in a modular format known as a Flexible Instructional Module (see Procedures and Standards for Developing Instructional Materials, 1978). This format would allow course directors to use some or all of the materials in their courses.

Generally, the assumption about shared ownership appears to have validity (see Documentation Report, 1979). However, the authors note that ownership and modular flexibility do not guarantee the wide adoption of materials developed through a collaborative interinstitutional process. Factors such as curriculum configuration, student preferences for instructional method, and changes in faculty and instructional content contribute to the choice of instructional packages.

Carefully Assess the Need

Durzo (1978) comments that faculty need to invest time and energy in developing an understanding of an educational problem before attempting to solve it. The authors agree with this concept and found that with a fast-moving, multiple faculty project this is a particularly critical concern. Before engaging in an instructional development project, make sure the faculty who have instructional responsibility for the related courses or units agree that there is a definite need for the instructional program under consideration. If faculty members do not perceive this need, they will provide little enthusiasm or assistance for the development of the package and may even hinder its development. Furthermore, faculty members may not use the package even if they have participated in its development. At best, they will tell students that the package is in the library should anyone be interested.

Students' perceptions of the need for the instructional package are also important. Students will probably not use the material unless required to do so. Hence, instructional packages dealing with "soft" subjects such as interpersonal skills, attitudes, or emotions—subjects for which testing is extremely difficult—often go unused by students. Our experience has borne this out, much to our dismay. If teachers expect students to be exposed to educational materials, they must require such exposure even if there are no cognitive gains expected.

Finally, even if a real need has been identified, it may not be necessary to develop materials from "scratch." Existing materials may be embellished or modified. ORMAC has carried out these "reconfiguration" projects with success. Such a process is often the more desirable alternative when one considers the time and energy needed to develop a new package from the ground up.

Do Not Try to Please Everyone

Solicit a variety of opinions from faculty and students about the content and structure of the package. Use this feedback during the developmental stages, but do not insist that the final product please everyone. Not only will production time and effort be increased unnecessarily, but a disjointed, mediocre product may result, that will not really please or please anyone. This problem can be alleviated by identifying one or two persons who are respected by the other experts and relying on their feedback most during the final stages of development. Forman and Richardson (1977) make a similar point in their article on a team approach to course development.

This heuristic dimension may appear to contradict Haney and associates' guideline that development should proceed on the basis of agreement. We do not wish to imply that agreement should not be sought as an ideal. However, we found that in dealing with the seven faculty "content specialists" from seven schools, it was difficult to reach agreement. After an initial consensus on the

CONCLUSIONS AND RECOMMENDATIONS

In pursuing the analysis of the concrete data from the Instructional Systems Development Project at the four universities, the project evaluators and development teams perceived an infrastructure of operating practices and patterns that in the past have often been ascribed to mere common sense. This paper attempts to point up the significance in this aspect of instructional development, and proposes heuristics as positive action guides which media specialists do and should follow to be effective in their work. The authors are supported in their assertion by the repeated surfacing of these heuristics at all of the institutions observed in the project.

In the final analysis, the application of heuristics may be the real service that the media specialist offers an educational institution. Scholarship, research ability, administrative competence, and technical know-how are necessary but not sufficient, and it may be that the ability to operate in the heuristic dimension is what truly makes the media specialist special.

The implications of this observation for media specialist preparation are monumental. The media field is faced with the prospect of institutionalizing heuristics into structured experiences and courses of study for both current practitioners and those in training. Few media study programs at present have these inputs. It is time they did.

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general thrust of an instructional package, most instructional development teams worked with only a few content experts.

Be Aware of Packaging Decisions

Recognize early the many decisions to be made and activities to be performed concerning the format, layout, production, reproduction, binding, and distribution of the package. It is all too easy to underestimate the time and cost involved. Consider, for instance, whether printed material will function as a one-time student workbook or as a reusable package. A personal workbook might be more convenient for the student, but it will drastically increase the reproduction cost. Similar considerations should be given to other media formats, particularly the costs of reproducing videotapes.

Media specifications are critical and should be considered early in an instructional development plan. Required technical specifications may prove to be a major unanticipated expense, particularly if additional hardware such as a Time Base Corrector is needed for reproduction. An excellent package which is difficult to distribute and duplicate is limited in its potential audience.

While these packaging decisions seem obvious, they are often overlooked. Decisions on such issues may result in expensive alterations if not made wisely at the project's beginning. As Durzo (1978) notes: "Projects begun without sufficient support may be compromised or may fail from undernourishment."

Select Appropriate Evaluation Approaches

Select an evaluation approach appropriate for the intended use of the package. If the material is designed to be used as part of a course, you may need only to collect attitudinal data about the package. After all, how many textbooks are selected based on empirical testing? While this may sound like heresy to some instructional developers, some educators believe that an educational experience, rated by students as interesting, motivating, useful, reinforcing, and so on, is worthwhile even if specific cognitive gains are not documented. If, however, the package is to be used independently, specific expected learning may need evaluation. While Durzo (1978) suggests a more comprehensive evaluation process, it may not always be practical or desirable to evaluate all aspects of an instructional development project.

Set Reasonable Time Lines

One of the greatest dangers instructional developers face is overpromising their projects. One area consistently overpromised is development time. This is particularly true in higher education where faculty and developers are involved in multiple university functions. Unless these multiple faculty responsibilities are taken into account, there is a strong temptation to set time lines which cannot be met. As a result, faculty members and developers alike feel inordinate pressure, which often causes hostility toward the project and project personnel. Such a deterioration of morale may compromise the educational and production quality. While this guideline is often mentioned in the literature, it is worth reiterating because of its importance. If realistic time lines are not set there is an increased likelihood that faculty and developers will become disenchanted with instructional development. So even though a package may be completed on time, an unintended outcome of "turning off" faculty to instructional improvement may result.

Choose Production Center

Choose the production site(s) which can do the best job. Although this sounds obvious, selection of a facility may be complicated by the fact that production usually generates revenue which all production houses seek. This revenue may create pressures to make decisions based on political or organizational expediency rather than production quality.

When selecting a production center, examine recent products to see what each center can do best. It may be desirable to elicit help from outside experts in choosing a production site: an outsider may have a more objective opinion on the quality of the work. Finally, consider the possibility of using more than one production center. This option is particularly appropriate when several media formats (e.g., slides, video) are to be used in the final product. A center specializing in production of a particular medium may be able to produce better quality at less cost.

Reward Students

Haney, Lange, and Barson (1968) urged developers to involve students in the development process. We have found that it is difficult to obtain student volunteers to participate in testing of either prototype or finished instructional materials. Consequently, when student participation is desirable, it becomes important to make a reciprocal arrangement with students representing the population for whom the package is intended. The most satisfactory method we have found is to pay students for time spent working with the instructional materials, filling out evaluation forms, and participating in debriefing sessions. Even a small reimbursement is important. Not only does it provide incentive for participation, it also places responsibility on students to take seriously their role in the developmental process.

The heuristic guidelines mentioned in this article are not meant to be exhaustive. While some of these guidelines are more relevant to large-scale projects, the majority are pertinent to any size instructional development project. It is hoped that they will add credence to some of the guidelines already found in the literature. Because it is unlikely that developers will have empirically based protocols from which to work in the foreseeable future, guidelines based on experience will continue to help instructional developers perform their jobs effectively.

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Changes in Instructional Development: The Aftermath of an Information Processing Takeover in Psychology

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EDITOR'S NOTE
At the 1978 AERA Convention, a panel of experts in the fields of learning and instruction "officially" announced the fall from favor of the mechanistic, black-box approach of behaviorism, and the rise to favor of the cognitive approach to learning—with its emphasis on what occurs inside the learner's head during the learning process.

One of the speakers indicated that this shift from behaviorism to cognitivism would have a profound impact on instructional development—to the point that there would be very little new in the field of ID for several years. He argued that because ID was based on the behavioristic learning model, it would take a while for ID to shift gears, to find a scientific grounding in cognitive learning theory, and to derive useful design principles from cognitive theory.

While instructional developers knew about, wrote about, and used cognitive learning theory even before this "official pronouncement" (see, for example, Wilson's article in JID, 1(2), spring 1978), and while JID is willing to leave it to its readers to decide how stagnant the ID field has been for the last two years, it did seem that a systematic and extensive analysis of the implications of cognitive psychology for ID had been missing.

And then, simultaneously, two excellent manuscripts discussing this very topic arrived at JID. Though they are similar in some respects, they are quite different in their orientations and emphases. Because of these differences, the excellence of the articles, and the importance of the topic, JID decided to publish both articles—one in this issue, and one in the spring issue.

The Low article, which appears here, explains cognitive learning theory in a concrete manner, using examples to illustrate its principles, and then provides a set of implications which seem to be oriented to a direct translation of these principles into the tasks an instructional developer performs.

The second article, by Wildman and Burton (to be published in the spring), explains cognitive learning theory in a more abstract, theoretical manner, and derives implications in the form of a set of questions which will probably be of more interest to those involved in theory, research, and teaching of ID.

Whether or not you, as a reader, agree with this distinction between the two articles, we are sure you will find reading both of them an important and enlightening experience. We also believe that they will set you to thinking about how ID is already changing, and must change in the future, as its learning theory base grows and changes.

Abstract. The characteristics of instructional development are determined in part by assumptions about learning drawn from psychology. If psychologists change those assumptions how will instructional development change? In particular, if instructional developers were to adopt the assumptions represented in information processing and schemata representation approaches to learning, how would testing, objectives, instructional strategies, instructional taxonomies, and analysis be affected? Each of these components would still be useful, it was concluded, but their nature would change substantially in almost every case.

If the basic postulates of learning psychology eventually prove unfruitful will instructional development wither? In other words, is instructional development merely an application of learning psychology that rises or falls with it? Or is instructional development independent—an enterprise in and of itself—able to exchange certain concepts and findings from the behaviorist tradition any time a more effective set becomes available?

The questions posed are not purely academic. Instructional development grew up in the 1960s with strong ties to the behaviorist tradition. In the 1970s developers have been out in the universities, industries, and armed services applying this new profession. Psychologists, meanwhile, have not been extending and refining learning theory to any great extent. Rather, they have been leaving their rat labs to drowsy to tinker with computers, hobnob with linguists, and muse over complex information processing in humans. The major thrust of work in psychology in the past few years has been in cognitive psychology (e.g., Glaser, 1978).

The time has come to identify what might result in instructional development if psychology leaves the behaviorist tradition by the wayside. Three major possibilities come quickly to mind. It may simply mean the demise of instructional development. Or it may mean that the behaviorist tradition will be kept alive in instructional development and that we will continue with business as usual. We would then be similar to lens makers who find the classical optics of the 1800s quite sufficient for the grinding of good lenses although physics, with the advent of the theory of relativity, has taken a whole new direction in the study of light. The third possibility is that instructional development may be able to live as comfortably with cognitive psychology as it has with the behaviorist tradition.

The purpose of this paper is to examine the third possibility and, in par-
particular, the implications cognitive psychology holds for some of the most fundamental components of instructional development—objectives, evaluation, instructional taxonomies, content analysis, and instructional strategies. First it is necessary to establish, at least in a general way, the type of science that instructional development is and how it relates to psychology.

Simon (1969) speaks of two types of sciences: natural science and design science. The role of natural science is to discover order and pattern in phenomena, to better understand our world and the creatures that inhabit it. The usefulness of the pattern or law is of secondary importance. Of primary importance is the discovery of what there is and how it works. Basic physics, chemistry, and biology are natural sciences. The role of the other type of science, design science, is the synthesis of useful products. Engineering, architecture, and medicine are design sciences.

Design scientists draw insight from the findings of natural scientists; that insight influences the product. Consider, for instance, the changes in the design of electronic devices over the past 30 years that have resulted from an increased understanding of basic electronics—a case of electrical engineering drawing insight from basic physics. However, insight provided by the basic science is not the sole determiner of the product. The use to which the product is put will dictate some of its characteristics, and if the use remains the same then some of the basic characteristics will still be necessary. For instance, the design of the modern radio, in spite of changes in our knowledge of electronics, must still incorporate many of the functions of its 1930 counterpart. It must have a means of receiving radio waves, of selecting the wave length to receive, of amplifying electronic impulses, and of converting these into sound waves. Thus, as long as the need for a component of a design science exists (e.g., electronic amplifier) that component will remain, although the means of producing the component may be modified as progress is made in the natural sciences.

Instructional development is more akin to design science than to a natural science. Its purpose is the synthesis of useful educational products rather than the search for fundamental laws of human cognition and learning. In the synthesis of their products, instructional developers have drawn insight from basic psychology. But the characteristics of the instructional developer’s products are dictated not only by this insight but by the use to which the product is to be put. Thus, as new insights are gained from basic psychology we might expect changes in the nature of some components of the instructional development process; we might also expect that those components would still be present as long as a need for them persists. How components might change in the light of recent work in psychology is the theme of this paper.

What Are Cognitive Psychologists Studying?

Two areas of work in cognitive psychology have potential impact upon instructional development: The development of information processing models of knowledge acquisition and the use of schemata to describe the organization of knowledge. Both will be described briefly here. For more extensive discussion see, for example, Anderson, 1977; Atkinson & Shiffrin, 1968; and Lindsay & Norman, 1972.

Basic differences between the behavioral approach and the information processing approach begin with how a learning event is described and what is presumed to be important. In behavioral psychology learning is described in terms of observable responses; these responses are presumed to result from certain stimulus situations. It is presumed that any learning event, even a very complex one, may be described entirely by relating sets of stimuli to responses. Any descriptions of internal events are avoided.

In an information processing approach the internal, covert events are seen as of prime importance. Because by their nature these events are not observable, no one knows exactly what they are like and the best that can be done is to attempt to model them.

1This is not meant to imply that psychology is the only area from which instructional development has drawn. Systems theory, for instance, is another. This paper, however, is limited to examination of the ties between psychology and instructional development and the results of changes in the former upon the latter.

This is not a unique approach in science—physicists followed the same path in attempting to describe the nature of matter. It was postulated that matter was composed of minute particles—atoms—too small to be directly observable. Later, models were proposed to describe the nature of the atom itself. These evolved from early planetary models (i.e., an atom is like a miniature solar system) to modern quantum mechanical models that are more mathematical than visual in their description.

Borrowing concepts about how computers process information, psychologists have developed information processing models of cognition. The main features of most models are a working memory or short-term memory of limited capacity, and a long-term storage of very large capacity. (See for instance Atkinson & Shiffrin, 1968; Lindsay & Norman, 1972.) A frequent example of working memory involves retention of a telephone number from the time it is read until it is dialed. The number of digits (about seven) and the amount of time they can be retained (a few seconds without rehearsal) is limited.

Long-term storage is evidenced by, for example, trying to remember the events of last Christmas. The items of information are not immediately present in working memory but after some searching the events are recalled—they become activated in working memory. A major area of work with these modes is to determine how information is transferred back and forth between short-term and long-term memory—storage and retrieval.

The test of a model, of course, is whether it explains anything. We have already seen how it might explain why short numbers (e.g., phone numbers) are easier to retain momentarily than long numbers (e.g., social security numbers). But can it explain anything else? As might be expected, psychologists have been applying the model to a variety of situations in an attempt to explain what can be observed in learning processes. Only one of these attempts will be described here, the attempt to model the subjective experience called comprehension or understanding. This one is chosen not only because of its potential importance to instruction (knowing what makes the difference between students compre-
heding or not comprehending instructional materials should be of some use to developers) but because it leads us to the notion of schemata. Consider the following four sentences taken from Bransford and McCarrell (1974):

1. The office was cool because the windows were closed.
2. The car was moved because he had no change.
3. The trip was not delayed because the bottle shattered.
4. The haystack was important because the cloth ripped.

Your subjective experience in reading the first two is probably somewhat different than in reading the last two. The first two seem to “make sense,” but the last two do not—even though you can probably define all the words in the last two. Now think of a ship being christened and reread sentence 3. Then think of a parachutist and reread sentence 4.

An Information processing model may be used to account for the experience: When information enters working memory (short-term storage) a context that may account for the information is selected from long-term storage. If there is a good match between incoming information and context then comprehension has occurred. For instance, most of us have a context or set of conditions and situations related to parking lots and parking meters. When reading the second sentence, we hypothesize that this is a parking meter context or situation. That context is brought to bear upon the information, and the features of the sentence seem to match enough of the features of a parking meter context that we are confident that we understand. All of this happens so quickly and effortlessly that we are unaware of it until we come up against sentences like numbers 3 or 4. Here there doesn’t seem to be enough information to guide us in the selection of an appropriate context. When we see the word parachutist in conjunction with sentence 4 we have a clue to the context, and comprehension occurs. Lindsay and Norman (1972) explain the process in considerably more detail.

If this model is correct, some interesting implications for comprehension result. First, comprehension is dependent upon material in long-term memory storage. If an appropriate context is not present, comprehension doesn’t occur. This occurs frequently during instruction—it is often called talking over the students’ heads. Second, comprehension is an active process. It is a continual checking of the data against the hypothesized context—a sort of goodness-of-fit test. It is a form of hypothesis testing considered by many a type of problem solving.

The way information is structured in memory seems to be important in comprehension. It is evidently necessary to retrieve an entire context—at times a very large group of items with complex interrelationships—in order to comprehend. One does not just retrieve a simple association for each word in the sentence and somehow add those associations up. If that were the case, it would be easy to understand sentences 3 and 4 above at first reading.

Psychologists have chosen to call these contexts schemata (some call them frames or scripts), a usage borrowed from Kant, Bartlet, and Piaget. Simply, a schema is a semantic network that describes several concepts and/or events and how they are related. Perhaps an example will make the concept of schema more understandable. Most of us possess a set of items and events in memory related to a trip to the grocery store. This grocery store schema contains such knowledge as what items may be located in the dairy products section, the bakery, and the deli; the usefulness of a cart when several items are to be purchased; how to choose the most promising line at the checkout counter; and the sequence of events that relate to going through the checkout. Because of this schema we know what to do if we are told, “Pick up a gallon of milk at the grocery store.” We do not need to be told in detail every step to take from the “In” door to the “Out” door.

Many will undoubtedly consider the constructs presented here too fuzzy and unscientific, and will opt for a return to measurable responses and associated stimuli. Psychologists, however, have not abandoned the measurement of responses. From models, one generates hypotheses that can be tested in observable, measurable ways. The models stand only as long as those hypotheses continue to be confirmed. So far, the constructs discussed here have withstood those tests. Nor need we be unduly rigid as to what a model should be. Simon (1978) noted that:

We are so accustomed to taking Newton’s Laws of Motion as a model of what a theory should look like—or Maxwell’s equations, or quantum mechanics—that it is worth reminding ourselves that a large number of important scientific theories do not resemble those in form. Instead, they consist of qualitative statements about the fundamental structure of some set of phenomena (Newell & Simon, 1976). An excellent example is the germ theory of disease, which, as announced by Pasteur, amounted to the following: If you encounter a disease, especially one that spreads rapidly, look for a microorganism. Darwinian evolution is another example, as are the tectonic plate theory of continental drift, the atomic theory of matter, and the cell theory. Sometimes, laws of qualitative structure are later expanded into quantitative theories, sometimes they are not. (p. 273)

With that brief introduction, let’s go to the task at hand. If an instructional developer shifts orientation from the behaviorist tradition to information processing and schemata concepts, what will change in the way instructional development is done? If one stops assuming that students learn responses and starts assuming that students learn information, then what will become of objectives, test items, instructional taxonomies, learning strategies, and content analysis in instructional development?

**Instructional Objectives**

Objectives are descriptions of the intended outcomes of instruction. If the outcomes of instruction are responses (as the behaviorist believes) then objectives should describe those responses—they should be behavioral. If the outcome of instruction is knowledge (as almost everyone believes) then objectives should describe or model in some way that knowledge.

From within the behaviorist tradition, Mager (1962) has given a good prescription for writing objectives. No such simple prescription is available for describing outcomes in information processing terms; however, Greeno (1976) provides some examples of what such descriptions look like. They have the appearance of flowcharts like those used in the preparation of computer programs, or of network representations of complex semantic relationships. For example, Figure 1 is an adaptation
from Greeno (1976) showing a network on the anatomy of hearing. Such flow-charts are more complex than the typical behavioral objective.

If instruction's goal is for the student to obtain certain knowledge, then a description of the content and structure of that knowledge should be quite useful to anyone helping the student (e.g., an instructional developer). From that description the developer can infer the elements of instruction. Behavioral objectives, on the other hand, aid only in testing the student—the developer must decide how a student would be led to successful test completion. Similarly, a carpenter finds a detailed description (blueprint) of a structure much more helpful in day-to-day work than a description of criteria by which the completed structure is judged adequate.

Consider an example. The topic of instruction is simultaneous equations; a behavioral objective might be the following:

Given 10 sets of simultaneous equations (none with more than 3 unknowns) write the correct value of each unknown in at least 8 sets.
In developing instruction for this objective does the developer have the student practice writing solutions? Probably not. Instead, the developer makes assumptions about the knowledge that the student must have in order to solve the equation. Thus, the instructional materials are full of computational algorithms and relationships—exactly the things information processing people talk about—presumed necessary to enable students to generate the appropriate responses.

If instructional developers find it necessary to address students as though they had minds and knowledge, then they should find it useful to work from descriptions of the desired states of knowledge.

All this does not mean that behavioral objectives are of no use. Where the outcome of instruction is a specific set of behavioral responses, the behavioral objective may still be the most appropriate form of expression. Nor does all this mean the abandonment of measuring the attainment of objectives. The attainment of the type of cognitive objectives described here can be measured. The simple difference is that the objective need no longer be just a description of a test. (Essentially, that's what a Mager objective is.)

**Instructional Taxonomies**

An important part of the instructional development process has been the classification of objectives according to one taxonomy or another. Of the taxonomies that are based upon experimental work in behavioral psychology, Gagne's (1970) is the most widely used. It has been so useful because its classes correspond to clusters of experimental research (e.g., research on pair associates, concepts, problem solving). Thus, if an instructional developer can classify an objective in one of the classes, the relevant behavioral research can be brought to bear.

A taxonomy based upon research in information processing is not currently available. Learning is viewed as the storage of information. If two tasks are different, it is because the content and structure of the information are different. From a behaviorist point of view, if one student responds with a memorized definition (verbal chain) and another responds by correctly selecting examples (classification) after studying the same topic, then different classes of learning have occurred. From an information processing point of view, the learning process is essentially the same; it's just that each student is selected to store different information. So, until someone demonstrates that it is worthwhile to classify information on some basis, there will be no taxonomy.

It is clear that a developer does not use the same instructional approach for every task. A behaviorally based taxonomy seems consistent with that since different types of learning suggest different approaches. An information processing approach accounts in a different way for differences in instruction between tasks. The instruction must somehow relate the content and structure of the information to be stored with that which is already stored. Because the content and structure differ from task to task and from student to student, differences in approach are required.

For example, suppose the topic is even numbers. Taking a behaviorist approach, the task may be classified as a concept and structured as follows: Research has demonstrated that concepts may be taught by presenting a definition and a series of examples; so this is a possible approach. Using an information processing approach might result in the following structure: The students have a very large set of digits stored already. If they can be given some sort of algorithm or other definition for determining when something is an even number, and a set of examples to clarify the definition, then they should know what an even number is. Notice that in terms of instruction, both orientations result in the same approach.

In teaching odd numbers, from a behavioral orientation the process described above (definition and examples) could be repeated. From the other orientation, it might be reasoned that because the students now know what all the even digits are, they can learn what odd digits are simply by being told they are not even. For some situations both orientations might yield the same instructional approach; in other situations they may not.

Although there is no taxonomy as yet, information processing does not exclude the possibility of different types of information processing. Tulving (1972) speaks of episodic and semantic memory. Episodic memory is memory of episodes or facts (for example, remembering a birth date or remembering that particular canyon is an example of the geological concept of a youthful valley). Semantic memory, on the other hand pertains to information that has been generalized beyond specific instances (for example, methods of solving all algebra problems of a particular class).

A problem often encountered in teaching involves students who try to incorporate into episodic memory information that should be in semantic memory. Trying to memorize a few specific solutions to problems rather than storing the solution process is an example. Those who have worked on instruction from the perspective of Gagne's taxonomy will probably recognize these as new terms for familiar ideas.

**Test Item Construction**

When behavioral objectives are used the test item (or set of items) becomes the direct evidence of the attainment of the objective. When learning is defined in terms of information processing and schemata, performance on test items allows one to infer whether the appropriate schemata have been established. In that respect, the role of the test item is very similar in both approaches.

Some researchers who have described knowledge in terms of schemata have not only used test items to infer whether the schemata are established but to diagnose just what schema or algorithm the learner is using when responding incorrectly. McKnight (1979), for instance, detected "bugs" in algorithms used to multiply quadratic equations. In one example, he detected a "bug" in a girl's algorithm, and gave a simple explanation of what she was doing wrong. She was then able to do all other problems of the same class. Collins, Elder, and Newman (1978) reported a similar, but more sophisticated approach—examining tests with a computer program for particular algorithmic errors. Brown and Burton (1975) have developed a program that enables a student to try out ideas in a learning situation. The program critiques "current solution paths," generates alternative hypotheses, and in general helps the student to debug ideas.

This type of approach is reminiscent of the attempts at intrinsic or adaptive programming made a few years ago. One
problem experienced with the intrinsic approach was deciding exactly what to do with the students who made errors. Often they were merely recycled through a more detailed explanation and given more examples. There were, however, some attempts similar to the information processing approaches described above. Consider an example given in Maltke (1969, p. 190):

The tangent of angle A is:

\[ .60 \] go to page 19
\[ .75 \] go to page 6
\[ .80 \] go to page 12

If the students apply the correct formula or algorithm they divide 3 by 4 and answer .75. It is quite easy to see how the two incorrect answers were derived (one by dividing 3 by 5 and one by dividing 4 by 5). Both are the result of applying algorithms similar to the correct one.

At the time intrinsic programming was introduced, it was argued that the student's response determined where the student was to go next. That is only partly true. It was the student's response coupled with the programmer's hypothesis or model of what cognitive manipulations the learner went through to obtain that incorrect answer. This is very clear from the Maltke example.

Information processing models hold some implications for another aspect of test construction—the writing of technically correct items. For years writers (e.g., Green, 1963) have produced guidelines for developing a correct item. Examples of such guidelines include making all choices in a multiple choice item grammatically consistent and avoiding patterns of responses. For true/false tests items should be entirely true or entirely false (not ambiguous) and trivial details should not make an item false. These rules—some 40 to 50 of them depending upon the author—seem to be derived from a mixture of experience and common sense. There is no mention of theoretical basis in the literature.

Greeno (1976) provided an information processing context for greatly simplifying these rules when he conceptualized testing in the following way:

Some information resides in memory as a substructure of a person's knowledge. A question is asked, and the question contains components that match components of stored information. A person retrieves the pattern, including components that were not in the question, and the new retrieved components constitute an answer to the question. (p. 155)

By way of example consider the following questions.

1. In an internal combustion engine what part converts the straight-line motion of the pistons into the circular motion of the drive shaft?

2. The sum of a father's age and his son's age is 46. The difference in their ages is 28. How old is each?

In the first question, the student who has done his work well retrieves the complex of information about the mechanical workings of internal combustion engines. Part of that complex or schemata is the relationship between the piston and the crankshaft, and the crankshaft with the parts in the drive train. He knows that as the piston goes up and down it turns the crankshaft in a circular motion. Thus, the answer is crankshaft.

In the second question the student recognizes that there are two algebraic equations:

\[ f + s = 46 \]
\[ f - s = 28 \]

This is recognized as a set of simultaneous equations. Stored with the concept of simultaneous equations is a solution procedure. When applied it yields the correct ages (37 and 9).

In both cases the questions provide enough information for the student to retrieve the appropriate context or schema from long-term storage. The student retrieves the entire context, not just those particular elements in the question. If the student has done his work and the schema is complete enough then the needed information is present and the answer (or the path to the answer) is apparent.

If the preceding is a correct description of how a student comes up with an answer then the trick of testing is to have a student respond by use of the appropriate schema or pattern, and only the appropriate schema. To do this two general rules of test item construction become apparent. First, one must provide enough information to allow the student unambiguous selection of the appropriate schema; second, the item should be devoid of extraneous information that would allow the correct answer based on something other than the appropriate schema.

Many of the rules provided in a work such as Green's (1963) may be conceptualized as specific instances of these two general rules. For instance, avoiding grammatical clues, patterns of answers, and implausible choices are specific means of preventing test takers from answering questions on some basis other than the appropriate schema. If a student discovers that the correct answer is always choice b, then he or she answers on that basis—a pattern

**"The time has come to identify what might result in instructional development if psychology leaves the behaviorist tradition by the wayside."**

**Instructional Strategies**

From a behaviorist point of view, it is the response that is learned. As a result early instructional development efforts stressed the importance of eliciting the correct response and reinforcing it—usually with feedback. With this general approach some rather specific guidelines for instructional strategies grew up. Divide instruction into small segments; have students respond at the end of the segment; structure the segment so that the student responds correctly, and so on.

No such specific guidelines for instruction have come out of the work in information processing. In fact, Glaser (1978) specifically cautions against such specific guidelines, at least at this time, and suggests that a "by the numbers"
approach may never be appropriate. Thus, a formula for design cannot be presented. Instead some important cognitive processes will be discussed that may be used as a knowledge of map reading is used when taking a trip. Each trip is unique and must be considered by itself. However, being able to interpret maps enables one to sort out the more promising routes.

As mentioned earlier, a cognitive process of central importance is comprehension. Rumelhart and Ortony (1977) describe comprehension as selecting schemata that account for the stimulus material. They add:

In this view, when a person uses a schema to comprehend some aspects of the situation, the schema constitutes a kind of theory about those aspects. Thus, in general, the process of comprehension can be regarded rather like the process a scientist goes through in testing a theory: evidence is sought which either tends to confirm it, or which leads to its rejection. Upon finding a theory which, to our satisfaction, accounts for the observations we have made, we feel that we understand the phenomenon in question. (p. 112)

If comprehension involves bringing to bear the appropriate schema or schemata to account for information, then one of the concerns in instructional design is to make material comprehensible in terms of the learner's existing schemata. This accounts for the emphasis in cognitive psychology upon introducing a general framework for the material to be learned (i.e., advance organizer) as a means of tying new information to old. It also accounts for the importance ascribed to metaphor (Ortony, 1975) as a means of integrating the new information into some existing schemata.

Rumelhart and Ortony (1977) have done some work on the creation of new schemata or the modifying of existing ones. They advance the concepts of schema generalization and specialization as two means of doing this. In schema specialization some variables of the schema are fixed or constrained to form a less abstract scheme. Consider the younger, for instance, who has a schema of attributes for the concept bird. In developing the new concept of bluejay many of the attributes of the bird schema are maintained but some of the attributes are constrained (e.g., size, color, head shape) so that they now define only the bluejay and no other bird. Schema generalization is the opposite of this.

Instructional guidelines based upon behavioristic concepts looked promising when the idea was new; it is only from a perspective of several years experience and research that they have waned in appeal. It is premature to say that information processing will provide anything better. However, there are at least two factors that suggest the potential for a longer-lasting influence upon the practice of instruction.

First, the studies of information processing almost always deal with learning tasks encountered in schools (Collins, 1977; Meyer, 1977). Thus, any insights gained through research should be easily applicable by instructional developers. Studies in behavioral psychology, on the other hand, usually involve tasks deliberately simplified beyond anything resembling school tasks and carried out on nonhuman subjects. As a result of this weakness in the behavioral approach, a finding such as backward chaining may originally be hailed as a great insight for instructional development but find very little application in educational settings.

Second, there is a body of literature from the late 1960s and early 1970s that demonstrates the tremendous power of appropriate schemata in the process of retention. These are the studies of mnemonic devices (see, for instance, Bower, 1970; Wood, 1967). What such a device does for a learner is to provide a schema or set of schemata for the integration of otherwise unrelated items of information, and its use results in substantial gains. If such gains can be made by the use of a somewhat artificial schema, then integration of information into a set of natural schemata in a cognitive discipline such as chemistry should be at least as impressive. This is congruent with our everyday experience. Chemists with well developed sets of schemata in a particular area of chemical research have little difficulty comprehending a research article in their areas and in remembering substantial detail from it. A novice takes longer to read it, understands less, and retains little. This seems to be what James (1891) was referring to when he wrote the following:

Most men have a good memory for facts connected with their own pur-
suits. The college athlete who remains a dunce at his books will astonish you by his knowledge of men's "records" in various feats and games, and will be a walking dictionary of sporting statistics. The reason is that he is constantly going over these things in his mind, and comparing and making series of them. They form for him not so many odd facts, but a concept-system—so they stick. So the merchant remembers prices, the politician other politicians' speeches and votes, with a copiousness which amazes outsiders, but which the amount of thinking they bestow on these subjects easily explains. The great memory for facts which a Darwin and a Spencer reveal in their books, is not incompatible with the possession on their part of a brain with only a middling degree of physiological retentiveness. Let a man early in life set himself the task of verifying such a theory as that of evolution, and facts will soon cluster and cling to him like grapes to their stem. Their relations to the theory will hold them fast; and the more of these the mind is able to discern, the greater the erudition will become. Meanwhile the theorist may have little, if any, desultory memory. Unutilizable facts may be unnoticed by him and forgotten as soon as heard. An ignorance almost as encyclopaedic as his erudition may coexist with the latter, and, as it were, in the interstices of its web. Those who have had much to do with scholars and "savants" will readily think of examples of the class of mind I mean.

In a system, every fact is connected with every other by some thought relationship. The consequence is that every fact is retained by the combined suggestive power of all the other facts in the system, and forgetfulness is well-nigh impossible. (pp. 662-663)

Analysis

The most common approach to content analysis in instructional development is built upon Gagne's (1968) work with hierarchies of learning. Reanick (1976) provides a good, brief description:

Learning hierarchies are nested sets of tasks in which positive transfer from simpler to more complex tasks is expected. The "simpler" tasks in a hierarchy are not just easier to learn than the more complex; they are in-
included in—components of—the more complex ones. Acquisition of a complex capability, then, is a matter of cumulation of capabilities through successive levels of complexity. Transfer occurs because of the inclusion of simpler tasks in the more complex. Thus, learning hierarchies embody a special version of a “common elements” theory of transfer. (p. 55)

In practice the more complex task would usually be described by the terminal objective and simpler tasks as the intermediate or supporting objectives. These intermediate objectives are usually discovered when one asks of the terminal objective: “What do the students need to be able to do before they can be expected to begin mastery of this objective?” The same question is then asked of the supporting objectives and so on until skills already possessed by the learner are reached.

In the behavioral approach described above, the relationships between responses are analyzed. In the information processing approaches to analysis less attention is given to the responses. Rather, attempts are made to describe or model the information and algorithms that must reside in memory before a student can accomplish a task.

The types of models used reflect the two disciplines that have contributed much to recent work in cognitive psychology—computer science (or, more specifically, artificial intelligence) and linguistics. Some models of cognitive processes remind one of computer programs. They are simple step-by-step descriptions of the algorithms sufficient to do the task. Some of Resnick’s (1976) tasks are of this type.

The other models are logical networks with nodes representing concepts with lines and with other symbols, such as brackets, representing relations between the concepts. These may be very detailed descriptions of a sentence (e.g., Norman, Gentner, & Stevens, 1976; Rumelhart & Ortony, 1977) or much more global descriptions (Greeno, 1976; Merrill, 1973).

In information processing approaches to instructional development, analysis may well become the most important phase. Simon (1969) points this out with an analogy suggesting that we consider the path of an ant moving across a wavy beach. “He moves ahead, angles to the right to ease his climb up a steep dunelet, detours around a pebble, stops for a moment to exchange information with a compatriot. Thus he makes his weaving, halting way back to his home” (p. 23). Simon points out that if the ant’s path were sketched it would have an overall direction but would be quite complex.

Simon then makes the following observation and hypothesis: The ant’s path is not complex because the ant is a complex behaving system; rather, it is a reflection of the complexity of the beach. Similarly, man is relatively simple as a behaving system. “The apparent complexity of his behavior over time is largely a reflection of the complexity of the environment in which he finds himself” (p. 25). When a student concentrates upon a particular body of information (e.g., a chapter in a textbook) the complexity of the learning process (if we agree with Simon) is due to the complexity of the structure of the subject matter. Thus, if we can describe the subject matter and the starting point for the individual—the existing knowledge structure—we can account for the learning path.

Conclusion

The trend in psychological theory and research is to move away from behaviorism (see, for instance, Brewer, 1974; Weimer, 1974). At the same time there is considerable theoretical development and research on information processing and schemata. Instructional developers cannot view these events with disinterest because their profession has taken inspiration from behaviorism for many years. This paper has been an attempt to sort out major features of the instructional development approach that would probably change and a few advantages that might result if the profession were to change points of view and begin to look for insight from this recent movement.

Instructional development is a design science. As such, its methods are determined both by the use to which its products are put and the natural sciences from which it draws insight. It is not surprising, then, to find that the major elements of instructional development will persist even though behavioral psychology may not. However, the nature of these elements may well change.

Specifically, we may find that:

1. Careful analysis and the specification of objectives will continue to be an essential step in the development of effective instruction. However, the nature of cognitive objectives will change from the description of responses to the description of information networks or schemata.

2. Because there is no basis for a taxon oury as yet in an information processing approach, each learning task will need to be considered as more or less unique.

3. It will still be necessary to have students respond to test items in order to infer their mastery, but the inference in many cases will regard the adequacy of schemata.

4. Prerequisites will be defined in terms of the learner’s existing schemata.

5. Advance organizers and metaphor will assume a new importance in instructional strategies; new strategies such as schema generalization and specialization will become common.

Implications for Instructional Developers

There is no denying that instructional development has been associated with the behavioral tradition in psychology (although that is not a necessary association). Because of old wars between cognitive and behavioral psychologists most instructional developers tend to think that an acceptance of anything cognitive amounts to a total abandonment of the instructional development process. This is not necessarily true. In fact, it is appropriate to view the shift of research to cognitive areas
in psychology as having a positive effect upon instructional development processes. An information processing approach to instructional development would still use the same major steps (objectives, instructional strategies, and so on). From the behaviorist tradition, instructional developers have evolved means for effectively carrying out each of these steps. These means will always be effective no matter what direction research in psychology takes. At the same time, information processing provides an alternative means for carrying out each of the steps. It adds to rather than replaces the instructional developer's set of tools. And for the practicing developer, the more tools the better.

Thus, the instructional developer is in the favorable position of having a variety of tools from which to select: those that best fit the situation or the developer's personal preferences can be used. When (and if) psychological research definitely demonstrates that one conceptualization of the learning process is more fruitful than the others, then instructional development may consider the abandonment of a particular set of tools.

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The Syracuse Model for Course and Curriculum Design, Implementation, and Evaluation

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Abstract. The procedure described in this article evolved from a design first implemented by the author in the mid-1960s. Extensive use over the years has led to development of the more generic and workable model discussed here. The model has been used successfully for workshops, course and curriculum design in institutions of varying sizes, and in most disciplines. While most instructional design models overlap to some degree, five factors make the Syracuse model somewhat unique: it is politically sensitive; it tests assumptions; it does not predetermine solutions; it is inexpensive to use; and program implementation can be fairly rapid. In addition, unlike most models, it tests faculty assumptions about both the content and the sequence of the instructional program.

The process model used by the Center for Instructional Development at Syracuse University is the most recent version of a design first developed by the author in the mid-1960s while at the University of Miami, when systems theory was first being applied to educational settings (Figure 1). The first model was extremely complex, had a major media emphasis, and was strongly influenced by the writings and work of Trump and Bayham (1961), and Lewis, Brown, and Harder (1964). Over the years, as work with faculty members in the design and implementation of courses and curricula continued, a more generic and workable model evolved. The present version (Figure 2), which has been used by many individuals at large and small institutions and in almost every subject area imaginable, has been fairly stable since the mid-1970s.

Like most systems, the Syracuse model appears generally linear in format. However, at any meeting some issues may be discussed that appear later in the sequence or the focus may be on previously discussed topics and decisions. In the real world, data are not always available when needed, and the priorities and needs of participants can directly affect what is being discussed at any given time.

All projects that the Center at Syracuse selects for implementation follow the general procedure outlined in Figure 2. Although the objectives and instructional content of all courses and programs are the responsibility of the academic department involved, an effort is made, by following this sequence, to ensure that every decision is based on accurate and comprehensive data and that all relevant factors are carefully considered. A project may take from 6 months to a year or longer to reach the field testing stage. While the time spent in the two major development stages (Phases I and II in Figure 1) will vary considerably from project to project, the initial design stage usually takes longer but does not require the intensive workload associated with production, implementation, and evaluation (Phase II). As will be noted, it is in Phase I that this model differs significantly from most others (Bass & Lumsden, 1978; Rowntree, 1974; Stamas, 1973).

Although Figure 2 is generally self-explanatory, several elements need emphasis.

-K.H.S.
Phase I—Design

Project Selection
To produce maximum impact from existing resources, it is the Center's policy to support major projects rather than many smaller ones. Therefore, projects at Syracuse tend to range from complete course redesign to developing an entire curriculum. Criteria for project selection include specific needs and problems identified by faculty, students, and administrators (e.g., attrition, lack of job opportunities for graduates, student and faculty complaints); available resources; the willingness of the participating faculty to follow the model; and support for the project within the department and responsible committees. Whenever possible, an attempt is made to involve more than one faculty member in the project and to keep all key curriculum committees and administrators informed throughout the process. This approach not only provides for a broader and improved content base for the project, but builds in stability for the program in case the key instructor leaves. It is essential for durability that the project be perceived by the participating faculty and cooperating department(s) as their project; ownership is a key for long-term project survival. While final selection rests with the staff of the Center, projects will not be considered for implementation unless they are supported by the chairpersons of the departments and the deans of the schools or colleges involved. (A more detailed discussion may be found in Diamond et al., 1975, pp. 32-35.)

Operational Component Sequence
While the preliminary component sequence represents the "ideal" program, the operational component sequence represents that ideal modified by consideration of various realities. Existing facilities, staff, and resources; the time available for instruction; the types of objectives anticipated; and the number and type of students must all be carefully considered. Appropriate changes are then made in the design, moving it from the ideal to a more realistic sequence which can be implemented. Modifications in the design will continue throughout the remaining
steps in the process until the program becomes generally stabilized. However, as long as the course or program is offered, some changes can always be anticipated in the operational component sequence.

One of the advantages of this approach is that each project design is unique. The content, the students, the resources and the strengths of the faculty, rather than the process, determine the final program design.

In curriculum projects, Phase I produces an overall design of the program, showing the interrelationship of courses and other instructional elements. Once this overview is complete, the next step is to repeat the design process (Phase I) for each of the instructional units (or courses). For example, the Center recently worked with a faculty team to design a new curriculum for music majors interested in entering the recording and promotional professions. Once the overall curriculum was designed, work began in Phase I for each of the several courses identified as being essential. While this recycling of the process to a more specific level may at first appear to be more time-consuming than other models, the opposite is true because each course, if more than one instructor is involved, can be worked on independently without losing the unity of the overall program.

Phase II—Production, Implementation, and Evaluation

This portion of the Syracuse model is fairly traditional (Kemp, 1977); however, several elements do deserve some additional attention. At Syracuse, an effort is made to approach the statement of objectives in a direct but not overbearing manner. In many instances, when faculty members have been forced to state objectives in a behavioral way or to place them hierarchically, faculty members were antagonized, and the objectives generated were rather unrepresentative and insignificant. A clear and useful statement of objectives can usually be generated in a nonthreatening way by simply asking faculty members to describe what students must be able to do to demonstrate that the instructional units have been successful.

Finally, it should be mentioned that the instructional approach or combination of approaches that will be used are those that are most flexible, least expensive, and most effective in meeting the stated needs. Whenever possible, existing materials are used.

Using the Model

As with most instructional systems, the Syracuse model is most effective when an individual skilled in the design process (an instructional developer) leads those responsible for the content through the system. While it can be used by an instructor working alone, experience has shown that an instructional developer, testing assumptions, providing alternatives, and serving in the role of a facilitator, can substantially help improve the final product. (For an excellent discussion of the relationship between a developer and a faculty member and their roles within this model, see Eickmann and Lee, 1976.) The model appears to be a generic one that can be effectively used at all grade levels and in all academic disciplines. While the questions asked may be the same, the answers and solutions will vary. Experience has shown that this is a model for instructional design, implementation, and evaluation applicable to
any instructional unit—a workshop, seminar, course, or curriculum—and in any instructional setting (school, college, industry, or government).

As noted previously, for maximum impact, emphasis should be placed on the design and implementation of major instructional components—courses and curriculums. When small elements (e.g., a laboratory portion of a course, a series of lectures) are the focus of the project, many basic questions are left unanswered (e.g., why the unit exists in the first place) and there is little impact on the program results (attrition, learning, enrollment). At a time when survival of a support agency may be at stake, significant impact becomes particularly important. This does not mean, as some have claimed, that people asking for help are turned away. This would be political suicide. Help is given but in a limited way so that most of the efforts of key professional staff can be directed toward areas where they will have major impact on the educational experience.

The Role of Evaluation

Evaluation is an essential element, not only within the model but in the Center itself. Since the Center was established at Syracuse in 1971, it has had two major administrative components—Development and Evaluation. Each is headed by an associate director. The role of the evaluation unit in the total process has been first, to provide information essential to the overall design activity, and second, to identify outcomes of the programs generated. In the broadest sense both formative and summative evaluation (Methodology of Evaluation, 1967, pp. 39-81) are integral components of the Syracuse model and of the Center.

Unique Features

While most instructional models overlap to some degree, several facets of the Syracuse model make it somewhat unusual.

1. It is politically sensitive. The project selection phase of the process is designed to ensure two things: that the projects will have a good chance of success, and that once implemented, the program will survive. This is done by working within the existing political framework. It makes sure that the project falls within the priorities of the institution or sponsoring agency, that the key decision-makers are involved in and support the activity (curriculum committees, deans, department chairpersons, department managers, and so on) and that the content experts are not only willing to devote the necessary time to the project but that they also have the respect of their peers and can provide the required academic expertise.

2. It tests assumptions. The model assumes nothing in regard to what a program should look like and what should be in it. By providing extensive data used in designing an “ideal” program and by having an instructional developer in the role of a facilitator, the process ensures that every option will be explored and that every assumption made by the teaching staff will be tested. This is not true of models that have, as their first steps, the generation of behavioral objectives. Experience has shown that many of the constraints assumed by faculty as they structure a course are not real and are based more on tradition than anything else.

3. It does not predetermine solutions. The specific instructional design developed and the instructional technology utilized grow out of the process. Use of the model, while it does tend to generate designs sensitive to the individual needs, backgrounds, and priorities of students, does not predetermine what the final product will look like. It is, in effect, bias-free.

4. It is inexpensive to use. The model requires no hardware, no extensive support staff. An instructional developer can often be working on four or more projects simultaneously and, fortunately, significant structural and content changes do not always require additional instructional dollars once the program is implemented. In many instances, little if any additional funds have been needed to implement a total redesign of an existing course. The final program is designed to operate within the scope of existing resources. Programs survive only when they are administratively practical; therefore, this model is designed to operate within the scope of whatever support is available at a given time, at a given place, for a given project. While accessibility to evaluation and production expertise is certainly encouraged and will result in a more effective and efficient product, the necessary experts are not always part of the development staff. However, specialists in these areas are often available somewhere in the school or college and these individuals may be willing to assist on a part-time basis.

5. Program implementation can be fairly rapid. While more time may be dedicated to overall design in this than in most models, the very fact that a general structure is completed before production begins can, as mentioned previously, substantially reduce the time needed for implementation. Experience has shown that many courses, while totally restructured to improve their content and instructional effectiveness, can be offered within a few months after the design phase is completed because they require the production of few new materials and can be taught in the traditional manner. Major change does not correlate, necessarily, with extensive use of technology and heavy production.

In short, the Syracuse model for course and curriculum design, implementation, and evaluation appears to work. The present version has evolved over time and has, in the process, undergone extensive trial under fire. During the process the staff of the Center has studied other models to see whether elements might have been overlooked and whether modifications are warranted. While another program’s staff may wish to evolve their own model, those involved should be encouraged to study the elements of this process in detail before omitting or modifying elements. Under any circumstances, the use of some clearly described procedure is essential. It ensures that all key questions are asked at the appropriate time and clarifies for the individuals involved where they are in the process and what their role in it will be. A workable model is essential for effective instructional development.

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ID Model for the Bell System Center for Technical Education
Symposium on ID Models—2

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Abstract. This paper discusses the seven-phase AT&T Training Development Standards (TDS) which serves as a model and guideline for the Bell System Center for Technical Education (BSCTE) course development. Some of the major topics covered include who does each of the steps, provisions made for non-instructional solutions, the role of evaluation, practical considerations of the model, and its unique features.

The Setting

The Bell System Center for Technical Education (BSCTE) in Lisle, Illinois, is the Bell System's major site for technical management training. The curriculum includes training in various technical disciplines including forecasting, engineering, business services, network operations, and technical planning.

To support this function, over 300 manager/administrators, instructors, course developers, and training technicians are employed at BSCTE. Typically the administrators at various levels of management are on rotational assignments from a Bell Operating Company. Many have had no previous experience with training but have held field or staff positions in technical disciplines. Most instructors and course developers are on rotational assignments of 2 to 3 years and are subject-matter experts (SME) in a technical discipline or job. The training technicians are often hired directly into BSCTE to serve as permanent staff members. They generally have a background in educational or instructional technology.

As an indication of the scope of the operation, in 1979 BSCTE offered over 30,000 student weeks of training (number of students times weeks of training) and spent over 10 million dollars for course development activities.

The Model

The model used at BSCTE is displayed in Figure 1. It is a detailed systematic course development process developed by AT&T (1978, 1979), entitled Training Development Standards (TDS). This same set of standards is used throughout the Bell System to develop both craft and management training courses. At BSCTE, the model has been used to develop seminars, workshops, and courses ranging from 1 or 2 days to 12 weeks in length and offered to a variety of job populations. The model consists of seven distinct phases with specific activities and products.

Job Functions Within the Model

Phase 1 (Preproject Study) and Phase 7 (Follow-up Evaluation) are conducted by two staff groups of instructional technologists. In Phase 1, the technologist collects and analyzes data from the initial training requests to determine whether there is a need for training or whether there may be a more appropriate solution. These requests are generated from our clients, the Bell Operating

Author's Note. The AT&T Training Development Standards model discussed in this article was developed during the period from 1971 until the present. During that time a number of contributions from the field of instructional technology have been incorporated. Because these contributions are not specifically identified in the Training Development Standards themselves, they could not be referenced in this article. However, whenever possible the vendors' training courses which are used to support the model have been referenced.
Companies. They generally focus on one problem area which impacts at least one job and often several different jobs. The target populations may range from less than one hundred to several thousand. The technologist studies the causes of the performance problem to determine whether it is caused by a lack of skill or knowledge. In a number of instances (40 to 50%), the technologist recommends nontraining solutions based on environmental causes for the performance deficiencies. In such cases, the nontraining recommendations are referred to the appropriate organizations and further course development activities are curtailed. This cost-effective screening activity saves the Bell System thousands of dollars each year in inappropriate training solutions.

The scope of this problem identification can involve one course development effort or several courses in the same discipline. However, whole-course curriculum development generally is established through a separate study called a “Curriculum Planning Study.” This study is also performed by the instructional technologist, but it has a much greater scope and involves different techniques and resources. The end product is a “road map” of the courses in the particular curriculum or discipline with a suggested training path for job incumbents depending upon their background, experience, and needs. The derivation of the curriculum road map helps to identify potential gaps and redundancies which then can be addressed by performing a Preproject Study in the specific problem area.

Instructional technologists conducting Preproject Studies are trained through the PRAXIS Corporation’s Performance Analysis Workshop (1973). In Phase 7, the technologist collects and analyzes data on an existing training course to determine whether or not the training content matches the current job. Often a judgment is also made about the value of continuing the training without change, revising it, or dropping it. At this point the technologist also examines the impact of any nontraining recommendations made in conjunction with the development of the training course.

Training for Follow-up Evaluation is provided through the Bell System’s Follow-up Evaluation Workshop. This course provides hands-on assistance in designing and developing the data collection and data analysis instruments as well as guidance on how to follow the process.

The assignments of Phases 1 and 7 to separate staff groups of instructional technologists rather than course developers is a unique feature of BSCTE’s use of the model. One of the purposes is to avoid the potential bias that course developers might bring to problem identification or evaluation of their own project. The technologist does not have a vested interest in the outcome in either phase. This staffing arrangement also provides maximum resource efficiency. These specialized staff members are able to react quickly to requests and to perform studies simultaneously without “switching gears” to other course development activities.

Phases 2-5 (Job Study, Design, Materials Development, and Field Test) are
conducted by a course development team consisting of one or more subject-matter experts/course developers and one training technician. The team begins by studying the job or portion of the job found to be deficient in Phase 1. After data is collected and analyzed, information is generated including additional performance deficiencies and their causes not identified in Phase 1; detailed procedures for tasks with deficiencies; skills and knowledge required to do the job; entry-level skills and knowledge; job aids if appropriate; and evaluations of existing training courses. The final product is a list of training and non-training recommendations which focuses on the performance deficiencies and skills and knowledge lacking in the target population. The training recommendations become the primary information in the design of the course. The non-training recommendations are referred to the appropriate organization for resolution.

Training on Job Study techniques and procedures is offered in the Bell System's Job Study Workshop. Job aids' training is offered in Harless' Basic Instructional Design Workshop (1978) and the Bell System's Performance Aid Development Workshop.

Design of the instruction in Phase 3 involves writing behavioral training objectives, developing tests to measure them, and developing lesson strategies and specifications. The design becomes the blueprint for actually developing the course materials. A variety of media options are available to BSCTE development teams including videotapes, audio tapes, slides, overheads, and easels. To assist in the selection, staff media consultants are used as well as the AT&T Training Media Guidelines (1976). In a number of courses, the basic strategy is to provide priming through lecture and discussion and/or self-paced materials, then hands-on practice through group case problems. This is particularly effective because BSCTE has complete laboratory facilities with the same equipment used in the job environment.

Training in the Design phase includes Harless’ Analysis and Instructional Design Workshop (1978) and Mager and Pipe's Criterion Referenced Instruction Workshop (1979).

Phases 4 and 5 involve Materials Development and Field Test. The development team produces the instructional materials designed in Phase 4. Each BSCTE course uses an Instructor or Administrator Guide, Student Work Binder, Student Reference Binder, and Course Binder. The Instructor/Administrator Guide documents in scripted outline format the words as well as actions that should take place in the classroom. In addition, the guide includes notes on how to prepare for the lesson. The Student Work Binder contains such items as the course objectives, lesson summaries, note-taking guides, and exercises which the student will use during the course and retain as a performance aid. The Reference Binder contains many necessary technical references that are required during the course. The Course Binder is an administrative tool containing the history of the development, inventory of course materials and media items, tests, exercises, and so on. The instructor retains and updates this binder throughout the life of the course.

During Materials Development, the course materials are developmentally tested and revised before field test. This may be done on a lesson-by-lesson basis and/or in the form of a whole-course tryout. The testing is generally done with a small group of target students rather than a full class. Developmental testing at this point reduces the number of major changes after the Field Test.

Phase 5, the Field Test, is conducted with a representative sample of the target population under realistic conditions. This may require conducting several sessions of the course. At BSCTE the developer or instructor conducts the course and the training technologist monitors and analyzes the results. At this point, the course objectives rather than the students are being assessed, so it is particularly critical to establish carefully the criteria for success prior to the test. After the data have been analyzed, necessary revisions are made in the materials.

Training in Materials Development and Field Test is provided through Harless’ Analysis and Instructional Design Workshop (1978). Mager and Pipe’s Criterion Referenced Instruction Workshop (1979) and Mager’s Instructional Module Development (1977). In Phases 2 through 5, the course developer and training technician are functioning as a team. The course developer who is an SME is responsible for the technical subject-matter content of the material, and the technician is responsible for the instructional quality of the course design and materials. This type of team assignment is another unique feature of BSCTE. It allows both members of the team to bring their own expertise to the development of relevant efficient training products. It is also more efficient than attempting to train either member in the expertise of the other.

In addition, there are two other job functions involved in course development activities. The Training Manager and the Project Manager are primarily responsible for administrative activities such as budgeting and scheduling. They also serve as consultants in the training development process and as reviewers of the products.

Phase 6 (Training Introduction) is conducted by instructors/administrators who are also subject-matter experts. A large percentage of BSCTE instruction is group-paced and instructor-led because of the volatility of the technical materials being taught; however, there are self-paced courses and programs available. This mode of delivery has been most effective in courses where there was a wide range of entry level skills and/or several different target populations.

The instructors/administrators are responsible for documenting necessary course maintenance items, particularly technical changes that will affect the training materials. When significant redevelopment of a course is required, it is reassigned to the developing organization at whatever phase is most appropriate.

Instructor training is provided in the Bell System's Instructor Training Workshop and administrator training in Mager and Pipe's Criterion Referenced Instruction Workshop (1979).

Noninstructional Solutions
There are several points in the model where noninstructional solutions (changing the job environment or learner’s attitudes) were considered. As previously mentioned, during the problem identification in both the Preproject Phase and Job Study Phase, nontraining recommendations are often made to the appropriate organization or department. In addition, during the Job Study, decisions are made about developing performance aids instead of formal training to correct identified performance deficiencies.

During the Follow-up Evaluation of a training course, it may also be appro-
propriate to determine whether or not the nontraining recommendations from the Preproject or Job Study have been carried out effectively.

Evaluation
The Follow-up Evaluation Phase has been described in some detail. It is the principal evaluation activity in the model in which data are gathered to determine whether or not the needs identified in the Preproject Study have been met and the training content matches the current job. However, formal Follow-up Evaluation Studies are not performed for every course because they are expensive and not always cost-effective. Generally, if specific problems or concerns with a course are identified, a Follow-up Evaluation will be recommended and funded. In addition, BSCTE has its own quality management system to evaluate the quality of all training products. Data are collected on course achievement, conference feedback, instructor observations, and course material evaluation. Managers review this data to determine what ongoing course maintenance is required.

Conference evaluation results are maintained by a measurements and evaluation group. This group provides guidance on test construction during the course development and later provides an administrative system to implement, score, and analyze the results.

Unusual Features of the Model
Throughout this article some outstanding features of the TDS model and BSCTE's application have been cited. Several other features should be noted. The TDS model is a guideline as well as a standard. Flowcharts and corresponding narrative descriptions detail the process to follow, the decisions to be made and the explanations of how to perform the activities. Another section of the TDS, the Reviewer's Standards, contains detailed checklists to "measure" the products of the activities. In this way the TDS provides guidance on how to proceed through the course development activities as well as providing a means to measure what has been produced.

The TDS is not report-oriented, as one might expect. It requires a great deal of documentation but it is "working" documentation which the team must produce in order to proceed through the activities. The reports required as part of the formal course documentation do not call for any additional items that were not part of the "working" documentation. No formats for these reports are dictated so it becomes the decision of a particular organization or manager as to what will be required. Most BSCTE managers have suggested a short narrative to guide the reader/reviewer through the "working documentation." This saves time and effort required for creating additional documentation that doesn't contribute to the course development process.

The most important feature of the TDS model is its universal application to training in the Bell System. The TDS is based on principles of systems development technology as applied to instruction. These principles are not unusual; however, the details of the model have been tailored to requirements that are unique to the Bell System.

For example, when studying jobs during Phase 2 (Job Study), there are three different and distinct paths of activities to follow depending upon which Bell System environment is being examined. In examining an existing job with deficiencies, the data collection activities as well as the sources and types of data will differ from those of a new mechanized system that hasn't yet been tried. These differences in environments have been built into the TDS model because no single process would be appropriate in the varied types of Bell System environments.

Because of its universal application in various Bell System training organizations, TDS has provided a common language and element of credibility between and within organizations. This applies to an organization like BSCTE, because development activities are conducted in four different divisions. A common model assists in the communication and support between divisions.

Practical Considerations—Constraints
The practical consideration of dealing with project constraints is built into the TDS process. Typical constraints include lack of time, human resources, funding, methods, and documentation. There are activities in many phases that call for documenting and analyzing possible constraints for their impact, then making decisions about curtailing certain activities as a result.

A good example occurs in Phase 2—Job Study. The TDS activity for determining the entering skills and knowledge of the target population is to develop and conduct a diagnostic test to measure the skills and knowledge possessed by members of the target population. Because there may be constraints on diagnostic testing, such as time, budget, available test subjects, and available equipment, the activity preceding the diagnostic test is included to determine the effects of constraints. The result of this determination may be to modify the diagnostic test or to eliminate it completely. The important considerations are that the constraints have been examined, the risks weighed, and a decision reached. Whenever constraints need to be considered, they are documented so that others can also evaluate the decisions made during a project. In addition, training/information sessions have been offered to managers and course development teams to discuss the practical applications and how to deal with constraints within the context of the model.

To conclude, the TDS model helps BSCTE to systematically develop training products within the constraints of its own unique Bell System environment.

References
Introduction

Training and education departments have limited themselves to instruction as the only solution to performance problems. Instruction is not the solution to most human performance problems, and even when it is one choice, other solutions can be more effective and less expensive to implement. Given an instructional problem, instruction can still fail to solve the problem. For example, a person who performs in the desired manner at the conclusion of the training program may, in the actual situation, fail to do the job. In this case, action is required to solve the environmental problems that cause ineffective training and the associated waste of money. Current instructional design models do not allow training professionals to do this. To ensure that training is not provided when a more cost-effective solution is available, a performance improvement model (Figure 1) is required. This model encompasses and expands upon a variety of techniques to provide practitioners with an approach that not only changes behavior, but also changes the total performance.

The present model, which has its roots in the techniques of performance engineering as proposed by Gilbert (1978), differs from other models in that the primary emphasis is shifted from instructional development to performance systems development. The performance improvement model extends our objective from the development of individual job tasks or behaviors to the improvement and maintenance of job functions or performances. Further, the model is not based upon a field or discipline but rather on knowledge, methods, and techniques derived from such diverse disciplines and fields as industrial and organizational psychology, educational psychology, educational technology, adult education, engineering psychology, industrial sociology, operations research, systems development technology, economics, and accounting. This broad perspective enables the practitioner to take advantage of the vast number of solutions applicable to any one problem.

Although the model draws from many fields and disciplines, it is not eclectic. The techniques and methods used have been combined in what Gilbert describes as a useful, simplistic, and coherent system for engineering human competence. Further, it uses social learning theory (Bandura, 1977) as a theory of human behavior that serves as a basis for analyzing and determining solutions to performance problems. People are seen as being motivated by a continuous interaction between personal and situational sources of influence. Thus, when people aren't performing as desired, it is normally because something other than their own 'motivation' is the cause. In general, it is hypothesized that people fail to perform as desired for one of two reasons: Either they lack the required skill, knowledge, or physical capability to do the job, or the environment does not support the desired behavior. Environmental nonsupport reduces the gamut from such problems as people not knowing what they are to do, to people being punished for doing what they are supposed to do. Between these extremes lie inadequate feedback, poorly designed tools, lack of job aids, and so on.

Level

Because the performance improvement model is accomplishment based, a great deal of flexibility exists in the problems analyzed and the level at which they are analyzed. It provides a means for identifying "what is," "what should be," and "what could be." Kaufman (1979) insists this must be done at an organizational as well as a societal level if the changes that the performance and instruction fields are...
PERFORMANCE IMPROVEMENT

FIGURE 1. Performance improvement.

capable of bringing about are to occur. The model can be used to solve existing problems or to prevent future problems. By utilizing the model when making change or when implementing new programs, large payoffs can be obtained. It ensures that the change or new program is in line with society's goals, the organization's goals, and the goals of all subgroups involved. It helps to ensure that proper communication takes place and that the required organizational climate is established.

Because the instructional development portion of this model differs only slightly from other ID models, the remainder of this paper will be dedicated to a discussion of the non-ID aspects.

Performance Analysis

Performance problems are normally brought to the attention of a training or education department by someone wanting a course either to solve a perceived problem or to prevent an anticipated problem. Regardless of why the request is made or of the organization level of the requester, the first step is to determine the expected outcome. This should result in a statement of desired performance which meets Gilbert's (1978) ACORN test. That is, the performance is described in terms of an accomplishment. This accomplishment is under the control of the worker, supervisor, manager, and so on. It is the only overriding objective or goal of any role. It is Reconcilable with other objective goals or missions of the organization. And finally, it can be measured, a Number can be put on the accomplishment. The "only" is dropped from the mnemonics when working with subgoals and objectives.

Failure to describe the desired outcome in this manner often can result in wasted time and effort in solving the wrong problem or, even worse, designing a program that creates a problem. To amplify this, let's look at a situation in which a department within a large university describes their mission as:

Accomplishment: Students graduated with degrees in X
Measurement: Number of students graduating
Number of honor students

This mission looks good. It is an accomplishment statement and can be measured. The department can control the number of students graduating, and this could be their main mission. However, the mission fails when looked at for reconcilability with the goals and missions of the university and the goals (values) of society.

Once the desired performance has been stated in the terms described above, it is usually possible to compare what is actually being done with the stated accomplishment. At this point, the discovery is often made that no problem actually exists. The requester may have been reacting to behavior rather than looking at performance. Orsborn (1973) has described this as the "activity trap."

If a discrepancy does exist, a determination is made as to whether or not the problem is worth solving. In many cases, even at this early stage of analysis, it becomes obvious that the cost of solving the problem is not justified.

Identification of Possible Solutions

Once a performance problem is identified and the desired result stated in quantitative form, the behavior of the people involved is analyzed to identify possible solutions. Most models start by determining whether the failure is a skill or knowledge deficiency before examining environmental solutions to the problem. In the Performance Improvement model, environmental solutions are questioned first. This is done because, quite often, even when a skill/knowledge deficiency exists, solutions other than instruction are viable, usually less expensive, and often more effective. Figure 2 depicts the order in which a problem is attacked and several of the possible solutions that can be implemented for each hypothesized cause. It should be noted that, quite often, more than one cause/solution exists for each performance discrepancy identified.
Data

Data (see Figure 3) are investigated first because often people fail to perform as desired because they do not know what they are supposed to do, how they are supposed to do it, or how well they are doing. The literature abounds in studies demonstrating the efficacy of feedback in improving performance.

The power of feedback is evident in the following case involving stockroom workers who receive orders for large quantities of small electronic components used in the manufacture of printed wiring cards. Once given the order, the workers "pick" the required number of each component from the various storage bins and send them out to the requester. If a picker selects the wrong component or the wrong number of components, time is lost in the manufacturing process, either because the wrong component is placed on a printed wiring board or restocking and reordering of needed parts is required.

Pickers provided randomly with feedback concerning their picking accuracy improved accuracy from a level of 90% to a level of 96%.

One last word about feedback. Feedback itself is not intrinsically good as Nadler (1977) points out. It is a useful tool only when the users understand why information is important, how data affect behavior, and how to use it.

Another form of data that improves performance is the job aid. Simple job aids can improve performance, especially if a task is performed infrequently or is rather lengthy and complex. Quite often job aids are not used because they are not readily available to the person needing them. In one case, a supervisor kept the job aids locked up because he felt they were too expensive to keep where the workers could get to them easily. Needless to say, they weren't used because it was time-consuming and difficult to get them from the supervisor. In this kind of situation, it is easy to explain to the supervisor why job aids should be made available to those who need them.

Telling people what is expected of them is another form of data that can be very powerful. Far too often, performance problems occur because people are not told what they should do, what the job priorities are, or when certain things should be done. If you have a hard time accepting this fact, think about your own job. Have you been told what you are to accomplish and how these accomplishments will be measured? If you are still skeptical, think about your secretary or the department secretary. The secretary probably does work for several people, has a variety of tasks, and is left to his or her own resources to determine what the priorities are.

Obstacles

Obstacles (see Figure 4) come in all shapes and sizes, ranging from the wrong tools to constantly ringing telephones. In one instance, a clerical staff was losing a tremendous amount of time because of ringing telephones. This group was responsible for answering phones for a group of approximately 40 instructors and for doing the typing, filing, and other clerical tasks. The phones were arranged so that each time an instructor's phone rang, it also rang on the answering box used by the clerical staff, who would stop work and count the rings. If it rang more than three times they assumed the instructor was out of the office and would then answer the phone. By changing the system so that calls were diverted automatically to the clerical staff after three rings, productivity was improved. Now if their phone rings, they answer it. In manufacturing operations, workers often don't have the tools they need. In an attempt to save money, first line supervisors may put off buying the tools required, not realizing the detrimental effect this has on productivity. As pointed out previously, obstacles come in all shapes and sizes. Mager (1970) describes a situation in which a plant manager came looking for a training program because his 60 employees kept falling asleep on the job. The training director looked around, talked to people, and did all the other things required to determine the real cause of the problem. He found the answer in the medical department. The workers were suffering from a disease that shows up in symptoms of sleeping sickness. Once this obstacle—their illness—was cured, their work improved.
Another obstacle to good performance is overconcern with behavior as opposed to accomplishment. For example, a new clerk was hired to perform a task. The person teaching her insisted that the new clerk do the job as it had always been done, even though there were many ways to perform the task. This overconcern with behavior resulted in less output from the new person and in unnecessary frustration with the job.

Consequences

What happens when workers perform as desired? Are they rewarded in some way? Are they punished? Are they ignored? It is possible that any or all of these possibilities occur. The same is true when they do not perform in the desired manner. Figure 5 provides some of the questions to ask to determine whether the consequences of behavior are the cause of poor performance. Close inspection of the consequences of behavior often yields surprising results. A striking example of inappropriate consequences can often be found in manufacturing operations where employees are paid based on the quantity of parts produced per day. Management also wants high quality output and cannot understand why high quality is not maintained. In situations like this, no amount of training, pleading, begging, or any other so-called motivational technique will have a long-term effect on performance. To obtain long-term change, the method of compensation must be modified.

Numerous other examples can be found. Connellan (1978) describes a situation where students going through a self-paced course were assigned KP, and other equally enjoyable jobs, when they completed a section of the course early. Needless to say, soon the students were using up all the time allotted to learn the materials. Once the training specialist involved realized what was happening, the procedure was changed to give the students three-day passes when they completed materials early; no one was put on a "special" detail because of early completion. Students were soon finishing well ahead of the time it had taken to cover the same material in the old course using conventional methods, and the test scores were as high or higher than before.

As these examples point out, consequences play a powerful part in determining people's behavior. However, consequences are tricky. What one person views as a positive consequence may well be viewed as negative by another. Some people may be concerned only with immediate consequences, while others are concerned with future consequences. To complicate the situation further, the same person may be responsive to different consequences at different times. Thus, when looking at consequences, it is imperative that the individual be considered. Theories such as Maslow's (1970) Hierarchy of Needs, and Herzberg's (1959) Hygiene/Motivation Theory are useful when analyzing consequences, because they provide a body of data, developed over time, about individuals and the consequences they are responsive to.

There are times when the consequences associated with a given job can't be modified. The job must be done in the prescribed manner; the pay, hours, breaks, just about every aspect of the job is locked in. In these cases
extra care must be taken to hire people who will find the existing consequences positive.

Individual

So far, we have described only environmental aspects affecting a person’s ability to perform in the desired manner. However, individuals may bring elements into a situation that prevent them from performing as desired. (Figure 6.) One of these is the knowledge that they bring to the job. Do they know how to perform in the desired manner? Or as Mager (1970) puts it, could they perform as desired if their life depended on it? If not, then instruction may be the solution. But even in cases where instruction seems to be the solution, it behooves us to look not only at the training required, but also at the job structure to see if it can be changed. It may be that some well designed job aids can greatly reduce the amount of instruction required.

It may also be that just providing the required training is not enough. The environment may not support the behavior. Consequently, it may be necessary to look at the environmental aspects of the problem situation, and not just assume that the training program will solve the problem.

The following case history demonstrates a situation in which training was a solution but not the only solution.

Considerable difficulty was occurring in the manufacture of electronic equipment because employees were mishandling a component that was extremely sensitive to damage from static electricity. Investigation showed that...
well designed instruction, can do a lot to reduce the differences between individuals.

Figures 2 through 6 show the order, the major questions, and some of the solutions that might be implemented for each of the questions answered, indicating that they might be a possible cause of the problem. The solutions listed sound somewhat simplistic, but their implementation is not always simplistic. As pointed out above, design of solutions may require knowledge of many fields and sometimes a definite expertise in a specific field. It should also be noted that the overall model is seen as a dynamic model and changes in solutions are being made constantly based on information obtained from evaluation.

Cost/Benefit Analysis

With one or more solutions to the performance problem identified, an analysis is once again made to determine whether the problem is worth solving. At this point, a better estimate of the cost of solving the problem can be made and the most cost-effective solutions can be determined. Quite often it may be cost-effective to improve performance to a certain level, but not worthwhile to go beyond that level of performance. Figure 7 graphically depicts this concept.

There are a few exceptions to this: one may be the training of a surgeon, another an airplane pilot. Failure to accept this concept may result in very elegant performance improvement programs that are scarcely more effective than less elegant and costly programs.

Program Design and Development

The design and development of the program depends on the solutions identified and the problems associated with designing, developing, and implementing each solution. In a case where people aren’t performing as desired because they don’t know what is expected of them, design and development are simple. In a situation where instruction, job aids, feedback, and tools are involved, program design will probably be complex enough to require development of a program for scheduling and control, and the involvement of many specialists to work on the design and development of the various phases of the program. Such a program could include instructional designers working with subject-matter experts to develop the instruction required; someone else working with the department supervisor and some of the employees to design a feedback system; and still others to develop job aids and tools.

Evaluation

Evaluation takes place at two levels. The first is the measurement of the program’s effectiveness. Concern is with measuring the performance specified during the performance analysis phase. The question being answered is, “Is the individual, group, department, or organization performing as desired?” If the answer is “Yes,” no further evaluation is required. If the answer is “No,” it is necessary to conduct a second-level evaluation, which consists of evaluating each of the individual change programs implemented. This evaluation may indicate that one or more of the individual programs should be modified. This is to be expected. The performance improvement model is a dynamic one, which not only allows for, but anticipates that change will need to be made continually.

Conclusion

The performance improvement model shifts the emphasis from instructional design to performance problem solving. This shift has major implications for those involved in training and education.

Instruction becomes just one of many tools used to solve problems. For the designer or presenter of instructional programs this may be advantageous in the long run because the likelihood of the training being effective has now been increased greatly. It also means expanding into areas heretofore considered out of bounds. Most non-training solutions have previously been the prerogative of line management; so was training at one time. But now, because of the complexity of training, there are staff groups to provide the training function for line management. So why not have a staff group assisting line management to develop and maintain a work place that supports the desired behavior (Patton, 1980)? Like instructional design, performance improvement techniques require a body of knowledge and a set of skills that the manager, with the day-to-day problems of the operation, cannot possibly develop and maintain.

References


A Management Framework for Program Development Techniques

Symposium on ID Models—4

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Abstract. Believing that most ID system approach models merely describe what should be done, but recognizing that ID techniques do provide operational directions for accomplishing tasks implied by those models, the author describes an ID approach model for organizing ID techniques. He categorizes a sampling of techniques according to the defined functions of the model, then identifies the techniques by name, purpose, and literature references.

The three instructional development system models described in papers by Diamond, Crilly, and Patton point out the differences among models. In this paper, a fourth model is used as a vehicle for looking within a model at the relationship between system components and the available techniques for accomplishing the functions of those components.

Most ID system models are descriptive rather than prescriptive; that is, they are more conceptual than operational. They provide an excellent overview and checklist of what should be done to accomplish an ID project, but they don’t tell how to accomplish the actual tasks of the project. However, the techniques used by instructional developers are prescriptive, so it is appropriate for ID system models to tell us what must be done, while ID techniques tell us how to accomplish what must be done.

Jacque Ellal, in his major work The Technological Society (1967), defines “technique” as “any complex of standardized means for attaining a predetermined result.” That meaning will be used here. It is contended here that many useful techniques have been designed to operationalize ID system models, but the techniques are scattered and difficult to find or assess. An appropriate framework for managing or organizing the wide range of techniques would be an ID system model. This would make it easier to search out the techniques for relevant purposes; such a systems view would reveal serious gaps in the array of available techniques.

This paper will present briefly an ID system model (developed over the years by the writer), recommended for organizing ID techniques and will categorize a sampling of techniques according to the functions served by the model. In addition, the techniques will be identified in terms of name, purpose, and literature reference.

The Systems Framework

The systems approach or management framework model (Figure 1), sometimes referred to as the “Dumbbell System,” uses the boundary concept to demonstrate the relationship among its several components. This is particularly important for focusing ID students’ attention on the exchange of essential information among the components (indicated by the arrows crossing component boundaries). In addition, the expanded support functions on the right reflect the writer’s view of its importance in making operational the development functions on the left. Equally important, the model is responsive to organizational and faculty development concerns.

Component Functions

The 13 components of the model are defined below and keyed alphabetically to the schematic in Figure 1:

A. Needs analysis—The process of determining changes required in an educational system based on evaluation data.

B. Adoption—The process of obtaining agreement and support from legitimizers, decision-makers, and gatekeepers to incorporate an innovation into an educational system.

C. Design—The process of analyzing, planning, and drawing up appropriate strategies to accomplish a proposed change in an educational system.

D. Packaging—The process of developing, acquiring, and assembling the necessary skills, facilities, materials, and equipment for the prototype change; for testing the prototype; and for revising on the basis of test data.

E. Installation—The initial process of incorporating the change into an educational system.

F. Operation—The process of maintaining the change on a continuing basis.

G. Evaluation—The process of collecting data and providing confirming and corrective feedback on the relevance, effectiveness, and efficiency of project elements.

H. Communication Network—The formal and informal procedures by which essential project information moves from the information generator to the information user.

I. Information Handling—The procedures for selecting, collecting, processing, transmitting, storing, retrieving, and assessing information relevant to an ID project.

J. Resource Acquisition and Allocation—The procedures for communicating ID project resource requirements, acquiring the resources, and distributing them among the elements of the project.

K. Personnel—Procedures for assigning personnel responsibilities and for handling internal personnel matters such as inservice training and discipline.

L. Facilities—Procedures for organizing and controlling spaces to serve
the purposes of an educational development project.

M. Management—The processes by which policies are determined, adopted, and enforced, and of coordinating and controlling the elements of the ID project in order to efficiently attain goals.

Range of Techniques

As indicated earlier, educational technologists deal not only with instructional development processes, but also with organizational and faculty development processes. Therefore, a sampling of techniques relevant to these three types of development is included here. Later in this paper, where techniques are matched with the components relevant to these three development types, significant gaps in the technique array are revealed. To make this organization of techniques really useful, additional techniques will have to be found or developed.

Among the many techniques identified and categorized, few of them are well researched, although testimonials to their value are relatively easy to find. It is important for researchers to realize the need for testing these techniques in actual use.

Categorization of Program Development Techniques

Space limitations prevent detailed description of individual techniques; however, each technique has been referenced so that any interest can be pursued. This writer and a colleague have an extensive work in progress that will provide prescriptive detail. Publication is planned for 1981.

As a convenience to the reader, the sampling of techniques in this work is presented alphabetically by title. The technique's purpose, the system component function(s) served, and a reference to further information are provided.

The reader may know a technique by a name other than the one presented here. When a technique has more than one name, the one most frequently found in the literature is used. The letters before each of the system component functions are used as the means for keying each of the techniques to the Management Framework Model in Figure 1. A second key is provided at the end of the paper to permit a user to start from the Model components in order to find an appropriate technique without having to search the alphabetical listing.

Alphabetical List of Techniques

1. Brainstorming (A, B, C): Helps small groups generate a large number of ideas about a given subject or problem in a short time. (Osborn, 1963)

2. Broken Squares (K, M): Game designed to sensitize group members to some of their own behaviors that may obstruct the solving of problems in the organization. (Pfeffer & Jones, 1969)

3. Content Analysis (H, M): A method of analyzing communications in a systematic, objective, and quantitative manner. May be used to analyze instructional messages. (Pool, 1959)

4. Contract Plan (C): A written agreement between student and teacher listing the goals, skills, and activities to be completed by the student within a specified time. (Haddock, 1967)

5. Cost Benefit Analysis (C, J): An analytic method designed to help a developer identify the most appropriate strategy among several alternatives, given cost constraints. (Goldman, 1967)

6. Criteria for Rejecting Clients (A): A checklist of eight items that help instructional developers determine whether to accept or reject a potential client. (Gentry, 1979)


8. Decision Tables (I, M): A decision-making structure for logically and consistently identifying the alternatives, conditions relevant to a problem, and their consequences. It has several advantages over flowcharting. (Hussain, 1973)

9. Delphi Method (A, B, H, M): Efficiently derives maximum judgmental input from a group of experts (anonymously to each other) on future events as they relate to some specific problem. (Helmer, 1966)


12. Fault Tree Analysis (A, E, M): Used for predicting the most probable ways by which a system or part of it might fail. It provides information for the redesign or monitoring of the system to prevent those failures from occurring. (Witkin & Stephens, 1968)

13. Field Testing (C, D): A process for developing, refining, and validating educational products to meet their intended objectives (Klausmeier, 1968)
14. Flowcharting (M): Graphically conveys relevant facts, ideas, and relationships in a comprehensive and understandable form. Permits analysis of the processes and decision points relevant to the solution of problems in program processes. (Schriber, 1969)

15. Force-Field Analysis (A, B, G): A graphic means for identifying and contrasting forces facilitating and inhibiting a desired operation or change. (Judson, 1966)

16. Formative Evaluation (D, C): Means for collecting appropriate evidence during the construction and trial of instructional modules in such a way that revisions can be made during these activities. (Bloom, Hastings, & Madaus, 1971)

17. Function Analysis (C): A process for determining requirements and subfunctions for accomplishing all program objectives. Concerned with what is to be accomplished rather than "how." (Kaufman, 1972)

18. Futures Wheel (A, C): Helps learners or clients visualize the impact of one set of events on other events. It demonstrates how developments in one area lead to developments (both positive and negative) in other areas. (Gunn & Guy, 1974).


21. Interaction Matrix Method of Sequencing Objectives (C): Method for determining the sequence of objectives, based on the principle of student movement from the known to the unknown. (Jones, 1972)

22. Interactive Television (C, L): Means of communicating over a distance on a face-to-face basis by means of a two-way audio and video signal. (Wittson & Benschoter, 1972)


24. Learners Verification and Revision—LVR (G): Process for monitoring a learner during trial of new instructional materials for effectiveness and revision data. (Stolovitch, 1979)


27. Merit Rating Chart (K, M): Determines employee progress and value to the organization. (Doohes & Marquis, 1959).


30. Network Analysis (B, H): Process which enables a developer to quickly determine significant communicative groups, links, and liaisons in an educational organization. (Farace, Monge, & Russett, 1977).

31. Nominal Group Process (A, C, M): Generates the maximum amount of judgmental data from a group in a minimum amount of time and gains agreement on the ranking of that data. (Delbecq, Van de Ven, & Gustafson, 1975).


33. Peer Tutoring (C): A learning process in which one learner teaches another. (Klaus, 1975)

34. Personal Inserted Filing System—PIFS (F, J, M): Provides an expansive, simple, reliable, and efficient manual information filing system. (Holmes & Gentry, 1979).


36. Relevance Trees (M): A process of working backwards from a goal to the present, generating a hierarchy of events that must occur to accomplish the goal, to determine the most relevant path. (Yates & Henchey, 1974)

37. Scenario Writing (A, C): A process for generating the most probable chain of events, given a random selection of events and trends. (Duperrin & Codet, 1975).

38. Sequencing and Clustering Large Numbers of Objectives (C): A procedure for helping faculty systematically to sequence and cluster program objectives, based on faculty judgment. (Centr, 1976).


40. Simulation (C): An instructional process allowing students to respond very much as they would in the real situation. (Greenblat & Duke, 1975).

41. Stake Model (G): Provides relevant evaluation of what was intended versus what educational programs accomplished. (Stake, 1975).

42. Storyboarding (C): A process for designing and sequencing visual and auditory events for nonprint media. (Kemp, 1963).

43. Summative Evaluation (F, D, F, G): Assesses the impact of a finished product or program. (Fitz-Gibbon & Morris, 1978).

44. Task Analysis (C, M): The process of breaking down a task into basic components or subtasks which must be accomplished in order to accomplish the larger task. (Gagne, 1974).

45. Task Description (M): A process for identifying and defining program development and learning tasks in terms of explicit behavioral performance. (DeCicco, 1968).

46. Team Teaching (C, M): Two or more teachers cooperatively plan, instruct, and evaluate one or more student groups in a common instructional space. (Shaplin & Ols, 1964).

47. Telelecture (C, L): Used to permit two-way audio communication between a lecturer and a group in another location. Uses telephone lines and equipment. (Goldman, 1978).

48. Time Study (D, F, M): Procedure for determining the amount of time required to accomplish a series of tasks necessary to a project. (Mundal, 1960).

49. Trigger Film (C): An instructional strategy used to elicit an emotional response in viewers, and to "trigger" meaningful group discussions of the issues portrayed. (Fisch, 1970).
Listing of Techniques by Component

Each of the component names listed below is keyed to the numbers of the techniques:

A. Needs Analysis: 1, 6, 9, 12, 15, 16, 29, 31, 37
B. Adoption: 1, 9, 15, 19, 30
C. Design: 4, 5, 7, 10, 11, 17, 18, 19, 21, 22, 28, 31, 33, 37, 38, 39, 40, 42, 44, 46, 47, 49
D. Packaging: 13, 16, 43, 48
E. Installation: 7, 12
F. Operation: 20, 32, 34, 43, 48
G. Evaluation: 13, 15, 16, 23, 24, 41, 43
H. Communication Network: 3, 7, 9, 20, 30
I. Information Handling: 8, 20, 34
J. Resource Acquisition and Allocation: 5, 25, 32
K. Personnel: 2, 26, 27
L. Facilities: 22, 47
M. Leadership: 1, 2, 3, 7, 8, 9, 12, 14, 20, 25, 26, 27, 31, 34, 35, 36, 44, 45, 46, 48

Summary

The list of techniques provides only a sample of valuable means for accomplishing our daily tasks. The purpose here was not to formulate an exhaustive list, but to provide a framework for systematically organizing techniques. Such a model not only provides ready access for program developers but also provides a framework for adding and deleting techniques. Finally, such an organization alerts developers to the need for additional techniques, and to the need for objective research on the effectiveness, relevancy, and efficiency of existing techniques. The writer would be pleased to hear of additional techniques with their references.

References

Gunn, J., & Guy, C. Easy ways to help children think about the future. The Futurist, 1974, 8(4), 186-188.


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ERIC Reports on ID Editor
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This study examined eight areas related to the problems of authoring and producing training-oriented videodiscs: The delivery system itself; media selection during instructional systems development; instructional strategies; author mock-up and simulation prior to premastering; premastering; mastering and replication; composition of videodisc authoring teams; and evaluation alternatives. Information and data were gathered through the study of two ongoing videodisc projects, as well as visits to industrial training sites and production laboratories and studios in the United States and Europe, discussions with representatives from military and civilian organizations, a technical literature search, and participation in conferences related to videodisc technology. It was concluded that optical videodisc technology and the authoring technologies associated with it are still in a state of flux and can be expected to be changing and evolving during the next five years. The Navy is advised not to plan to deploy videodiscs widely in the immediate future, but to continue to track the rapidly developing knowledge in the videodisc field.—Microfiche 83 $, paper copy $6.32 plus shipping as document ED 181 887


Since the usefulness of the Interservice Procedures for Instructional Systems Development (IPISD) depends on authoring aids which enable personnel to translate IPISD procedures into instructional products, this project examined the feasibility of providing such "how to do it" guidance for the instructional design and development tasks identified for Block II.2—Develop Tests, and Block III.4—Develop Instruction. On-line authoring aids were developed to be used on the PLATO IV Computer-Assisted Instruction (CAI) system, as well as off-line versions, to assist the author in preparing materials for both CAI and non-CAI delivery of instruction. The three levels of evaluation conducted included an informal evaluation on existing IPISD materials, a formative evaluation of the newly developed authoring aids, and an evaluation of the instructional materials produced. Findings were positive—user acceptance of the authoring aids was high, and the time required for development of test and lesson material was significantly reduced. Based on these findings, the development of such aids for additional blocks of the IPISD model have been initiated. Flowcharts for both blocks studied and the authoring aids are provided, and a 97-item bibliography is attached.—Microfiche 83 $, paper copy $12.32 plus shipping as document ED 181 924


Two projects conducted at the Center for Research on Learning and Teaching at the University of Michigan examined factors involved in the adoption and dissemination of classroom innovations by college instructors. The first investigated the use of various instructional technologies among faculty members who received released time and financial
support for the development and implementation of innovations in their courses, and a random sample of faculty members who received no support. Results showed that the former group significantly increased their use of innovations whereas the latter showed no such increases. The second project focused on a random sample of faculty members and examined those factors used to predict the use of instructional innovations: (a) formal network—the extent to which respondents used various instructional support agencies; (b) informal network—the extent to which they relied on colleagues for information and support for teaching; (c) extrinsic reward—the extent to which respondents perceived teaching as a rewarding activity; and (d) intrinsic reward—the extent to which they found teaching and working with students personally satisfying. Support was found for formal network, extrinsic reward, and intrinsic reward as predictors, as well as a relationship between the use of instructional improvement agencies and the use of instructional innovations.—Microfiche 83¢, paper copy $1.82 plus shipping as document ED 175 424.


This description of the marketing process as a practical way to manage the function of instructional development emphasizes the importance of the identification and evaluation of customer needs before developing objectives. To assist the instructional development agency in focusing on this aspect of planning, a checklist of possible marketing elements is provided for assessing the nature and structure of the market, services desired, distribution channels, and developing appropriate advertising and pricing policies. The application of these marketing procedures to a hypothetical development agency provides an illustration of the process.—Microfiche 83¢, paper copy $1.82 plus shipping as document ED 175 437.


Given the difficulty of representing the interests of a diverse faculty, the developers of this 5-year plan sought relevant information from both faculty and administrators in an assessment of the needs of Utah State University for this period. Some conclusions about needs have been drawn from existing data—enrollment can be expected to remain steady or to experience a slight decline; the emphasis on quality teaching will increase; students are dissatisfied with survey courses; critical skill areas include communications, problem solving, and managerial practices; and graduate teaching assistants have little preparation for teaching other than their specific academic training. The objectives of the Instructional Development Office are reviewed in the context of these needs, and areas of staffing and financing of instructional development activities are addressed. An implementation flowchart of activities scheduled in the ID office over the next 5 years is provided, as well as a list of references and the tabulated data from a survey of undergraduate students in survey courses.—Microfiche 83¢, paper copy $3.22 plus shipping as document ED 175 439.


This assessment of the effectiveness of instructional development evaluation programs suggests that, although it is a basic tenet in instructional development that teaching improvement is closely linked to effective evaluation, it is ironic that most ID programs have themselves been evaluated only superficially if at all. There is very limited evidence that teaching practices and learning effectiveness have been substantially changed as a result of instructional development. Evaluation strategies are discussed on three levels: (a) activity within the program, which can be monitored in terms of number of contacts made and distribution of instructional materials; (b) attitudes can be measured (teaching, learning, and program); and (c) the collection of empirical evidence for changes related to improved learning and teaching. In practice, most evaluation of ID programs has been confined to the first two levels. A recent informal survey of instructional developers in several countries revealed that not only are evaluation efforts scarce, but many instructional developers are resistant to the very notion of formal assessment of their activities. Some reasons for this, including budgetary considerations, are explored.—Microfiche 83¢, paper copy $1.82 plus shipping as document ED 177 968.


Written for use by vocational-technical teachers as a reference, workshop resource, or resource for an individualized self-paced inservice package, this text is designed to provide knowledge and techniques necessary to develop or adapt modules for individualized instruction. Part 1 discusses individualized instruction in perspective, as applied to vocational-technical education, and the degree of individualization. Principles for planning, developing, and adapting modules are presented in the second part. Discussion of planning for individualized modules includes an assessment of the basic curriculum requirements, feasibility considerations, and specific suggestions for sequencing, selecting learning resources, and planning learning experiences. Preparation of student and teacher guides is explained, and an outline of guide components and sample guides are provided. A step-by-step process for developing modules includes planning instructional requirements and strategies and preparing learning activity and teaching guides. Guidelines for the evaluation of modules for possible use or adaptation are divided into two categories—the evaluation of the total package, and the evaluation of the instructional materials.—Microfiche 83¢, plus postage as document ED 182 518.

In this age of high speed presses and rapid copiers, we sometimes forget that the money spent on a book should buy us information—not paper. The $5 spent for a copy of the Ontario Society for Training and Development’s (OSTD) Competency Analysis for Trainers: A Personal Planning Guide comes to a little over 12¢ a page. That may seem like a lot, but remember the original premise. You’re buying information—quality information, at that—not paper and duplication. If OSTD were Time-Life and could sell millions of copies, the price would drop, but OSTD is not Time-Life; it’s an organization that uses dedicated volunteers, has a small professional audience and press run, and simply wants to cover its expenses. What seems like a high cost has some logical reasons.

But let’s talk about value. What kind of information does your $5 bucks buy? Essentially, you get a checklist for doing a self-analysis of your instructional development skills, especially as they relate to your own job! Although the checklist is primarily for trainers in business/industry/government, it still covers most of the skills and knowledge used by instructional developers in education. If you are in education, it will give you some fascinating insights that you may not have thought of before. For example, have you recently reviewed your skills in “reading texts and journals with speed and comprehension,” or in “nonverbal communication,” or in “active listening,” or in “explorative questioning”? If you are like me, the answer is, “Not much.” OSTD’s skill checklist is comprehensive and provides a lot of food for thought. Perhaps I can’t apply it totally to my own situation—I mean, why should I worry about electrical safety in presentations?—but it makes me think a lot about what skills I have and should have as well as what skills I want in the developers I train and the developers that work for me. Prodding me into that kind of thinking is well worth the minor cash investment.

Now for the structure of the book itself and the ideas therein. The ideas first. The Canadians have broken the training and development field into 12 competency areas, ranging from course design, research and development, evaluation, through training equipment and materials and instructional techniques. If this may sound a lot like AECT’s definition of instructional technology, it’s because of the borrowing of ideas—it’s more of an idea whose time has come. Under each function is a list of items—mostly activities—related to the function. At this point, our Canadian colleagues go a step further. They have identified four very general “jobs” or “roles” in instruction: instructor, designer, manager, and consultant. The first three mean about the same to them as they do to us. “Consultant” deserves some explanation; although undefined in the publication (one of its minor flaws), a consultant is a specialist outside the organization who is brought in as needed to give specialized assistance in the instructional development. A good example in formal education is an evaluation specialist with in-depth testing, evaluation, and research design skills. The checklist forms a matrix with the “jobs” on one axis and the “competencies” on the other axis. This lets you—when you work through the checklist, pick the job most related to you and compare your skills to that job. The OSTD is realistic enough to realize that everyone can’t do everything. (The consultant, though, is expected to have almost all the competencies. That’s a natural inference, given that the consultant’s job is a composite of all specialists.)

The checklist has a large number of activity statements under each competency. What you do for your own self-evaluation—and subsequent professional development—is to rate your own competency on a scale of 0 to 5. This will give you a look at how you measure up. But that’s just the beginning. You then rate the same competencies (again a 0-to-5 scale) in terms of how your employer views these competencies. The next step is to subtract the job importance rating from your own self-assessment. While the publication suggests a number of ways to evaluate the results, their general rule-of-thumb works pretty well. If you have a difference of zero, things are generally all right. That is to say, you may have exceptional skill and your employer rates the skill highly (5–5 = 0) or perhaps you are of average skill and your employer thinks average is fine (3–3 = 0) or maybe you can’t perform the skill at all, but it doesn’t matter a bit in your job (0–0 = 0)—the point is the relation to your current job. A high positive number (+5 or +4) means that you are highly skilled in this competency, and it doesn’t really matter on your job (5–5 = 0). Not to worry. However, negative numbers are cause for concern. They mean that your skills are not as high as the job demands (+1–5 = −4).
If you are thinking about keeping your job and growing with it, these are the competencies with which you should start.

Let you worry about your skills in general, the book suggests making a personal balance sheet, listing your positives and negatives. This gives you an overview of your skills in terms of your job. You can easily modify the process to produce a self-evaluation in more absolute terms. While all this might sound complex, it's harder to describe in a review than it is to do in practice.

The OSTD also suggests a number of ways in which the information can be used—hiring, job descriptions, career planning, among others. Where it seems invaluable to me is in the area of "professional development."

DID's Professional Development committee is now looking for ways to help instructional developers improve themselves. If there's something to this process of ID, one might make the case that the starting point is a needs assessment. If we are talking about personal growth, we have to think about a personal needs assessment. The OSTD publication is an excellent tool for that personal needs assessment. It's the starting point that most of us need but never really take the time to find. I recommend it highly for that reason. It should make you think—and after that, you're on your own. Reviewed by Clinton J. Wellington, Chairperson, Department of Instructional Technology, Rochester Institute of Technology, Rochester, NY 14623.

Instructional Development: The State of the Art

Edited by Ronald K. Bass, D. Barry Lumsden, and Charles R. Dills

A brief survey of books on instructional development would reveal a number of texts on how to do ID. Books on the systems approach and the various techniques of designing instruction can be found on every practitioner's and student's bookshelf. What had been missing, however, was a book dealing with the underlying issues of doing ID, the philosophy of our field, and future directions for instructional development.

Instructional Development: The State of the Art begins to fill this void. Here, in one volume, are discussions by 17 authors on topics that go beyond the technical aspects of how to do ID, to the more human aspects of how to make ID a successful enterprise.

The book makes a significant contribution to the literature of the field in that it addresses important issues in the practice of instructional development which had not been so well addressed before. It presents some new and advanced thinking about the ID profession. As such, it is a professional book, not recommended for the beginning student. It does not teach ID, and both assumes and requires a background in the field on the part of the reader. For the advanced graduate student and the ID practitioner, the book can be quite useful.

Each of the 13 chapters has a different author; however, the editors deserve commendation for their efforts to have each chapter written on about the same level with similar styles. All the contributions are relatively short and to the point. Although there are times when the reader might wish for more than the authors provide, most of the authors have provided excellent bibliographies.

"The Relationship Between Faculty Development (FD), Organizational Development (OD), and Instructional Development (ID): Readiness for Instructional Innovation in Higher Education" (Chapter 1, by Allen J. Abedor and Steven G. Sachs) leads off by putting the ID, FD, and OD debate into perspective, centered around change and the adoption of innovations. A strong case is made for looking beyond instructional development for vehicles to help instructional innovation take place. The reader gains a better understanding of how instructional change is facilitated in an institution.

"The Intricacies of Instructional Development" (Chapter 2, by Marvin E. Duncan) points to what is now considered to be a crucial aspect of ID: the effective interpersonal relationships established between the developer and the client. Duncan offers some practical suggestions towards this end and helps the reader become more aware of just how important interpersonal communication skills are for the ID practitioner.

"Strategies for Teaching and Learning Instructional Design" (Chapter 3, by Frank V. Colton) discusses the problem of teaching a design course from the designer's own perspective. Colton reports the results of a survey of the types of ID courses being taught at some institutions and the years in which they were initiated. Although the information is somewhat dated, the reader is left with an appreciation of the breadth of coverage an ID program must undertake. The chapter continues with some ideas for teaching ID which readers may find appropriate for their own courses.

"Comprehension and the Design of Instructional Materials" (Chapter 4, by Buford E. Wilson) discusses concepts in comprehension, communication psychology, and learning. Wilson impresses upon the reader the value of carefully choosing the words and visuals being used in an instructional sequence.

"Selection and Evaluation of Alternative Teaching Methods in Higher Education" (Chapter 5, by Dean N. Osterman) presents a model for selecting alternative teaching strategies that appears to be applicable to a variety of situations. Osterman's writing is well organized and makes use of excellent figures and tables as he presents a summary of five alternative teaching methods (auto-tutorial, computer-based, guided design, learning packages, and personalized). Finally, an in-depth evaluation matrix is presented which should help the practitioner who needs a ready reference to assist in the selection of an appropriate teaching strategy.

"Cognitive Style Mapping: Its Place in ID" (Chapter 6, by Ronald K. Bass and James D. Hand) discusses how knowing how individual students learn can lead the developer toward the proper instructional prescription. Although the concept of cognitive style mapping is explained only briefly, the reader will certainly be interested in exploring this useful process further, perhaps seeking additional training in the application of cognitive style mapping to instructional development.

"The Organization and Implementation of Instructional Development Programs in Higher Education: A Review of the Literature" (Chapter 7, by Joseph J. Durzo) provides an excellent review of the various approaches to instructional development from an administrative viewpoint. Durzo brings together key elements from the literature explaining how an ID program might be organized for greatest positive impact.
upon the institution. The author concludes the chapter with a number of well-documented implications for implementing ID programs.

"Instructional Improvement Centers in Higher Education" (Chapter 8, by Barry Bratton) reports on research to determine the current status of IIC's, giving the reader a good picture of a "composite" IIC. Of particular interest were reasons that certain institutions might not establish an instructional improvement center (fear of change, low priority for teaching improvement, a frill, and so on).

"Politics of ID in Higher Education" (Chapter 9, by Robin E. Lawerson) provides an incisive discussion of the political realities of doing ID. Lawerson describes eight factors, developed through an extensive literature review, which influence the political success of an ID project. The chapter looks at the political realities from a change agent's perspective, laying a good basis for a still-to-be-written chapter on the "hard politics" of doing ID (the type we all hate to admit exists).

"Economic Evaluation In/Of Instructional Development" (Chapter 10, by Gene Wilkinson) considers the reality that ID practitioners are being called upon to justify their efforts in terms of costs as well as effectiveness. Wilkinson's chapter provides convincing arguments for doing cost evaluation as well as introducing a number of techniques for ID decision-making based upon cost considerations.

"Collective Bargaining: Adversary or Colleague" (Chapter 11, by Dennis Schaffer) reports on a study of instructional development practitioners to determine their feelings about whether collective bargaining will have a positive or negative effect on their profession and on the general improvement of instruction at their institutions. While the results are inconclusive, Schaffer suggests that the impact of collective bargaining on ID will depend upon a number of things, including whether or not the agreement takes the role of ID into consideration or is in conflict with it. One thing is certain, collective bargaining is an influence that ID practitioners must learn to deal with.

"The Challenge from Without: Some Unpopular Views on Instructional Development Topics" (Chapter 12, by Robert A. Braden and William R. Terrell) raises some very important and controversial questions about the practice and the profession of instructional development. These ID practitioners who are comfortable with their own definitions of ID, their own role descriptions, and their personal and institutional philosophies of doing ID may become uncomfortable after reading this chapter. As the authors state, more questions are raised and none are answered in this healthy introspective look into the instructional development field.

"Instructional Development: The State of the Art" (Chapter 13, by Ronald K. Bass, D. Barry Lumsden, and Charles R. Dills) looks at the previous 12 chapters of the book and tries to present a concise picture of just where the instructional development profession stands in terms of its image, its accomplishments, and its directions for the future. In noting the many problems and challenges for the future, the editors of this book lay an acceptable groundwork for the further development of the profession.

Instructional Development: The State of the Art may be the book that presents a number of issues in the field to the advanced ID graduate student. It may help the practitioner define his or her own role. It may give the instructional designer new tools and ideas to apply to the craft. It may be the book that helps the ID profession set some future directions for itself.

This reviewer did find some problems with the book. Some chapters were more useful and better organized than others. Of course, other readers will find the utility of each chapter dependent on their own positions and needs. Some chapters failed to summarize their findings as well as others. The use of summary tables or charts would have helped here. Some chapters, especially those in which the reporting of data dominated the discussion, have, of course, become dated faster than others. Yet, the issues raised in all the chapters are as valid today as they were when the book was published and will undoubtedly be valid in the years to come. The book also would have been helped by grouping the chapters in sections, according to their topics (e.g., change, new techniques, issues).

But a more fundamental problem with the book is its limited scope. It deals only with ID as it is practiced in institutions of higher education, ignoring the many other arenas where instructional development is practiced with great intensity today (e.g., business and industry, government and military, health care). This concern does nothing to decrease the value of the book. The topics discussed and the issues raised have implications wherever instructional development is practiced.

In the 1970s, ID was, for the most part, a function of the university. In the 1980s we know that is not the case. The application of ID in new sectors of our society brings forth new challenges and new concerns. No one is more aware of this than the editors of this book. That is why a new edition is under development which will deal with the expanded nature of the instructional development field. It is written, equally well, it will join Instructional Development: The State of the Art as a major contribution to the advancement of the profession.