## Contents

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Future of Instructional Development, Kenneth H. Silber</td>
<td>2</td>
</tr>
<tr>
<td>The Future of Instructional Development—Through the Looking Glass Darkly, Kent Gustafson</td>
<td>2</td>
</tr>
<tr>
<td>Instructional Development: Deliverance, Kenneth H. Silber</td>
<td>2</td>
</tr>
<tr>
<td>Using Gagne's Events of Instruction as a Guide for Producing Stimulus Material, Walter Wager</td>
<td>6</td>
</tr>
<tr>
<td>Scientific Notation in Instructional Design, Richard C. Boutwell</td>
<td>9</td>
</tr>
<tr>
<td>Descriptors of Evaluations in Instructional Development: Beyond the Formative-Summative Distinction, Earl R. Misanchuk</td>
<td>15</td>
</tr>
<tr>
<td>Evaluation Technology in Instructional Development, Robert D. Tennyson</td>
<td>19</td>
</tr>
<tr>
<td>Promoting Adherence to a New Paradigm of Instructional Management, Robert A. Reiser</td>
<td>27</td>
</tr>
<tr>
<td>Putting Together an Instructional Development Team, Edward E. Green and Gordon E. Mills</td>
<td>29</td>
</tr>
<tr>
<td>Instructions for JID Authors</td>
<td>34</td>
</tr>
</tbody>
</table>

## About this issue

Kenneth H. Silber, Editor

This first generally available issue of JID contains both practical and theoretical articles related to four aspects of instructional development: the field itself, strategies for performing ID, the evaluation component in ID, and the management of the ID process.

Gustafson and Silber present opposing views on the future of instructional development. The papers, originally presented at the Division of Instructional Development Symposium "The Future of Instructional Development" at the 1978 Association for Educational Communications and Technology Convention, deliberately take extreme positions on the survival and utility of ID. Their goal is to stimulate developers to think about their field and to promote further dialog on this crucial issue.

Wager offers a strategy developers can use to plan instructional stimuli based on Gagné and Briggs' events of instruction and shows how the strategy can be operationalized using a media analysis worksheet. Boutwell calls for the use of a more scientific way of describing these events of instruction and offers a scientific notation that increases the precision of describing the events and allows for more accurate comparison of research on instructional strategies.

Tennyson emphasizes the role of evaluation in every phase of the ID process and describes the type and outcomes of the evaluation done at each phase. Misanchuk (like Boutwell) calls for a more precise way of describing what we do. He proposes a new term, confirmative evaluation, (to describe a purpose for evaluation not covered by the formative and summative designations) and proposes two dimensions: one to describe the how of evaluation and one to describe the what of evaluation.

Reiser describes the problems that occur when the implementation of an instructional system does not match the plan designed during the design of the system. He explains the instructional management paradigm that gives rise to this situation and suggests ways in which the developer must change this management paradigm by becoming involved in the implementation, as well as the design, phase of ID to overcome these problems. Green and Mills discuss the practical ways of overcoming the problems created by using a team approach to ID including role definitions, communication channels, and written documents.
The Future of Instructional Development—Through the Looking Glass Darkly

Editor’s Note

The papers by Gustafson and Silber were originally presented at a Division for Instructional Development Symposium on “The Future of Instructional Development” at the 1978 Association for Educational Communications and Technology Convention in Kansas City. The speakers were asked to take diametrically opposed positions on the subject (Gustafson the negative, Silber the positive) with the expectation that the audience would begin to think about and question the extreme positions taken and develop their own positions somewhere in between.

When reading these papers, therefore, the reader is asked to bear in mind: (1) the deliberate one-sidedness of the papers; (2) the fact that the authors could just as easily have switched sides in the debate, and that while they believe what they say, they do not see the world in as black-and-white terms as the papers suggest; (3) the papers were prepared as oral presentations, not journal articles and the visual aids used during presentation were not reprinted here. These articles are included because of the important ideas they raise and not because of their scholarly approach to the subject or the number of references they cite.

It is hoped that the readers of these papers will respond in the same way that the audience did. IJD welcomes responses to these papers—either in the form of papers expressing other views on the future of instructional development or in the form of letters to the Editor addressing a few of the points made in these papers.

Kent Gustafson
Area of Instructional Development
and Technology
Michigan State University
East Lansing, MI 48824

The looking glass of Lewis Carroll’s immortal Alice in Wonderland is a most appropriate instrument for examining the future of instructional development (ID). It points out very clearly the flaw in the perspective of instructional developers who have been using the looking glass only as a mirror. We gaze with great content and satisfaction at our supposedly handsome countenances completely ignoring the world on the other side of the mirror.

As you may remember, Alice found all manner of strange and disturbing personages and situations when she went through the looking glass, and my intent is to provide you with a similar experience. I hope the point that Carroll’s writings were really designed for an adult target audience is not lost on my readers. I also remind you that, in terms of the future of ID, forces in the outside world will have a major impact on the future of ID. We may think we represent such a powerful idea whose time has come that we chart our own course, but history will show the folly of such thinking. Our future is inextricably linked to a number of external forces that we can at best modify. Self contemplation may be good for the spiritual self but is folly in terms of forecasting the future. We are part of the environment not the environment.

The World Beyond Education
So let’s go through our looking glass and examine the larger environment:

Instructional Development: Deliverance

Kenneth H. Silber
Educational Technology
Governors State University
Park Forest South, IL 60466

The movie title used in the title for this paper serves to underscore the reason that I believe the future of instructional development (ID) is an optimistic one. The problems identified by Kent Gustafson are, in my opinion, external to ID itself and can be overcome if we can “get our act together” and deliver what we promise to deliver.

Our Goal—and our Failure
The first question we must address is: What do we promise to deliver? Regardless of the specific theoretical approach to or model of ID each of us ascribes to, I think that all of us can accept this as our goal: to provide effective, efficient, relevant instruction at a reasonable cost using a systematic process of designing, implementing, and evaluating the instruction, a process that is based on sound learning and instructional theory.

Because most of us accept this as our goal and because many of us believe we do indeed meet this goal, the next question we must address is: Why is there skepticism about whether or not ID can deliver?

To me, the answer is that we, and our predecessors, promised to deliver too much too soon—and did not deliver. We promised to “save education” though:

• behavioral objectives,
• criterion-referenced testing,
• programmed instruction,
What conditions are likely to develop between now and 1990? First, some general conditions.

The Economy
- U.S. and world economics will continue to experience severe cyclical ups and downs with relatively short ups and longer downs. Inflation will run between 6 and 12 percent annually in the U.S.
- The balance of payments deficit will remain large because of two primary factors: (1) U.S. dependence on foreign oil imports and (2) foreign protectionist policies established as countries attempt to control their own economies.

Energy
- Energy costs will spiral rapidly upward and depress economic growth.
- A greater share of resources will be devoted to locating, acquiring, processing, and transporting energy. The days of cheap energy are past.

Employment
- Unemployment will remain at or above current levels.
- Underemployment (placement in a job for which the employee has greater than required education) will grow.
- The market for highly educated personnel will not expand beyond its current 15 to 17 percent of jobs. Thus, increasing numbers of higher education graduates at all levels will find little upward mobility.
- Job security will become of increasing importance.

Mood of the Public
- There will be a continued erosion of people's faith in technology as a means of solving problems. Appropriate technology will receive greater attention. We will not turn away from technology, but we will examine it much more closely.

The World Within Education
Now, what about education? (I am excluding business, industry, and military training for the moment; those kinds of training represent a different situation and will be discussed later.)

Higher Education
- Rapidly increasing costs will be largely uncontrollable.
- Ability to react to changing conditions will be poor.
- Reductions in the number of students will force curtailment of programs and staff reductions in some places.
- Unionism will increase; faculty members will be concerned about job security.
- There will be reductions of "nonsensical and auxiliary services"—guess where that leaves ID personnel? (The point should not be missed that higher education has been one of the primary employers of ID types.)

Community Colleges
- There will be no real growth in most areas.
- Where overbuilding has occurred, there will be some reductions.
- Competition with higher education for the available students will be fierce.
- As in higher education, unionism will increase and faculty members will be concerned about job security.

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*individualized instruction,
* self- and mediated-instruction,
* the 90/90 criterion,
* formative evaluation.

We have since learned that none of these techniques individually can meet the goal. In the process of learning that however, some of us and many outside the ID field became skeptical of our techniques, ourselves, and our promises to deliver.

This skepticism leads to our next questions: Have we gone beyond that early stage of promising too much? Do we now know enough really to deliver what we promise? I believe that the answer to both questions is a resounding, "Yes!" Let's briefly review what we now know and what we can deliver."

ID Today and Tomorrow

*Systematic Process.* We know that the individual components that made up our early promises did not work because they were applied in isolation; to work they, and other components, must be applied to solving instructional problems by a systematic process. Though there are different versions of it, we know basically what the systematic process—the ID process and model—is, and more importantly, we can apply it to solve real problems.

*Needs Assessment.* We know what a needs assessment is, why we should do it to begin the ID process, how to do it, and how to interpret it (Kaufman).  

*Learner Analysis.* We know why it is important to analyze the learners for whom the instruction is to be designed and what some of the key characteristics we must analyze are—for example, cognitive style (Hill), aptitudes (Allen, Cronbach and Snow), brain functioning (Debbs, Herman).

*Management of ID.* We know the importance of, and some strategies for, implementing ID within the constraints of an organization, changing the climate of an organization to make it more receptive to ID, developing ID teams, and working with clients in a facilitative manner (Diamond, Durzo, Heinich, Mager, Lawson, Reiser, Silber).

*Task/Content Analysis.* We know how to take a set of desired goals or competencies and break them down into their component tasks (Gagné), concepts and relationships (Markle, Merrill), or algorithms (Landa, Gerlach).

*Instructional Strategies.* We know how to sequence the tasks/concepts to be taught (Gagné, Merrill, Homme), use appropriate instructional events to teach them (Gagné and Briggs), design lessons to teach the most difficult intel-

Continued on next page

Fall 1978, Vol. 2, No. 1
The Future of Instructional Development—Through the Looking Glass Darkly (continued)

Public School

- With no growth in real dollars available, many schools will face continued real-dollar reductions as populations fall.
- Very few new teaching positions will be available; the average age of teachers will rise rapidly.
- Willingness to experiment with new "fads" will lessen.
- There will be a reduction of auxiliary services not deemed essential to the basic missions of the school.

Overall, in education, I predict no great catastrophe or crisis that would precipitate major restructuring.

Changes will continue to occur bit by bit as policy makers, administrators, and teachers respond in essentially conservative ways and attempt to maintain the status quo.

Facing Tomorrow

So, where do all these less-than-rosy predictions about the future leave our good old ID specialist? Well, let's ask some hard questions:

1. Where do most of us work? Higher Education. (A most unlikely candidate for rapid transition to the new millennium.)
2. What are we doing? How many of us who call ourselves ID specialists are really doing any systematic design of instruction? Are we really doing ID or something else?
3. How many well-documented cases can you cite of instructional development efforts that were or are effective—and continue to operate? (Getting a project completed only to have it not be adopted doesn't count.)
4. How many cases can you cite of efficient instructional development? Either in terms of the resulting product or the process (or both) can we really provide education with even partial answers to the dollar crunch, or do we simply want new dollars to do our thing?
5. How much evidence can you cite that ID has increased the relevance of instruction? How many times have you asked your client whether the content is even worth being taught? Are we helping people do better work that shouldn't be done at all?
6. What is the survival rate of the results of our development efforts? If we dare go back 1, 2, or 3 years later, what would we find?
7. Where do we obtain the funds to support our development efforts? Are we supported by a firm commitment of institutional dollars or do we find it necessary to work on a project-by-project basis seeking whatever funds happen to be available?
8. Are we focusing our efforts on the central problems of educational institutions or are we off chasing any old wind that blows? The sudden discovery of "faculty development" by ID types provides some evidence on this question.

If I were a vengeful type, I would now provide a self-test for each reader to complete and mail in for evaluation, but I suspect the low return rate would re-

Instructional Development: Deliverance (continued)

The intellectual skill level for the learner—the concept level (Markle, Merrill and Tennyson, Wilson)—and modify the strategies for different types of learners (Allen, Cronbach and Snow).

Legal Selection. We know some general rules for selecting media based on the type of objective (Allen, Goodman, Kemp, Merrill) and some rules for modifying that selection based on learner characteristics (Allen, Cronbach and Snow).

Evaluation. We know about the importance of evaluating (or testing out) our instruction, the number of times in the ID process it should be done, and the techniques to use in doing so (Scriven, Stufflebeam, Baker, Kelley, Children's Television Workshop).

Cost and time of ID. We are learning to apply economic and management models to the ID process to provide cost effectiveness data related to instructional development (Cook, Doughty, Mager).

Diffusion of ID Concepts. We are beginning to learn how general diffusion models apply to the acceptance of ID by those outside the field and to develop strategies for gaining the acceptance of the ID Philosophy and approach (SRI).

Even this brief list of what we know today about the systematic process of designing effective, efficient, relevant instruction indicates that we can deliver today.

But even with all we know today, instructional development is just in its infancy. As we develop more instructional theories and procedures and test them through systematic research, we will be able to deliver even more in the future. Just developing are new techniques for:

- identifying key aptitudes of learners;
- adapting instructional strategies, sequences, materials, techniques, and individual stimulus displays to the individual differences in learners;
- using algorithms in instruction;
- providing cost-benefit data about ID to decision-makers;
- infiltrating institutional structures and overcoming resistance to ID.

Defining ID Problems

Despite the rosy future orientation I was asked to take in this discussion (and also happen to concur with), I would be remiss in my analysis of the future of ID if I did not add a concluding caveat. If we are to succeed in the future, and deliver, there are some problems the field of instructional development must overcome.
duce the validity. As an alternative I will present my own opinion about how we measure up on each of these questions.

1. Higher education is not going to save the world all by itself. In fact, it needs a little saving itself.

2. An awful lot of people have suddenly become ID specialist but continue to do what they did before. So, the numbers game of counting people in the field of ID is meaningless.

3. Our ability to prove we can develop effective instruction is improving and this is the area in which we have had the greatest success. It is disturbing, however, to realize how many ID reports still report only what was done and not how well it was done.

4. We haven't even scratched the surface on the issue of efficiency. We haven't even developed a language, not to mention a data base. Personally, I think this should be the primary area of concern if we expect to have a future.

5. We have paid almost no attention to the issue of relevance. Again, we don't even have a language for discussing the issue.

6. The survival rate of our development efforts is distressingly low. If we could say ID programs gradually evolved into something even better, that would be nice, but generally they are unceremoniously dropped.

7. Most of our funds are from external sources; we respond to whatever hand will feed us.

8. Our projects usually are not central to the institution's missions and areas of concern. In fact, many of us never even think to ask if they are.

To add insult to injury, I will also point out a couple of other not-so-trivial concerns related to whether or not ID has a future. First, we operate totally without anything resembling a theoretical base. Sooner or later one must emerge if ID is to become viable. Second, the ID literature is distressingly thin. We have thousands of publications and tens of ideas. As our friend Alice would say, "You'd generally get to somewhere else—if you ran for a long time like we've been doing." Neither of these two issues will be explored in detail, because they assume there is a future, and I am not convinced we will be around long enough that it will even matter.

At this point I might add a few comments about business, industrial, and military training. These areas often have made excellent use of the ID process. However, it must be remembered that their goals are often quite limited and the analysis, development, and evaluation readily linked to a real world referent. For example, when trainees are being paid it is relatively easy to calculate the cost-savings of one training procedure over another. This is not to say that all business, industry, and military training has made appropriate use of ID. There is a substantial amount of fuzzy thinking and development in these settings, too. But there are at least a few exceptions worthy of note.

In conclusion, I think the ID movement must seriously re-examine its basis of existence and modus operandi. We have been tolerated and even accepted in some locales, but that is not sufficient for survival. I believe ID can have a future and it can make a significant contribution to education in this country. Like Alice shaking the red queen and thus awakening herself, my intent is to jar us into awareness. We must stop reflecting on what we have been and start looking on the other side of the mirror. To do otherwise is to ensure that we have no future.

**ID Skills.** Not all instructional developers (including the author) know all they need to know about ID to be able to deliver as effective professionals. Instructional developers must keep pace with the current body of knowledge and techniques in the field—through formal instruction in degree programs or professionally sponsored continuing education programs or through self-initiated and self-directed reading and study.

**Additional Skills.** While all the knowledge and techniques discussed earlier are necessary to be a successful instructional developer, we are beginning to suspect they are not sufficient. There may be additional general skills, related to the way an individual processes information and interacts with people, that make the difference between a successful instructional developer and a not-so-successful one (Wallington). We need to find out what these additional skills are and incorporate them into training programs, continuing education programs, and our own self-directed professional growth and development.

**Target Audience.** No matter how much it delivers, not all potential users of instructional development will accept it. Instructional developers need to rethink their emphasis on higher education and on gaining acceptance of ID in public schools. They need to expand the target audience for applying instructional development to areas that might be more amenable to its philosophy and processes—for example, business and industry, medical education, hospital training, developmental/remedial education, special education.

**Professional Home.** At present, there is no one professional home for instructional development as a field and instructional developers as professionals. The Division of Instructional Development, Association for Educational Communications and Technology, the International Communications Association, the American Educational Research Association, a division of the American Psychological Association, the National Society for Performance and Instruction; the American Society for Training and Development and so on, each considers ID "its territory." Developers must decide whether this situation is beneficial (diversity of viewpoint) or detrimental (fragmentation); and if it is detrimental, they must decide how to deal with it.

**External Problems.** ID as a field must recognize and deal with the problems that Kent Gustafson clearly identified in his paper.

In summary, I believe that instructional development can deliver right now and will be able to deliver even more as knowledge and techniques expand; the future of instructional development is a healthy one. Like any field, instructional development has some problems. I am convinced, however, that with perseverance we will solve these problems as we have solved others. Then the instructional development reach its full potential: deliverance.
Using Gagné’s Events of Instruction as a Guide for Producing Stimulus Material

As a cognitive theorist, Robert Gagné is interested in the internal or mentalistic nature of the learning process. He has adopted and elaborated an information processing model that hypothesizes internal events take place in the learner’s head during learning. These events include the processes of reception, perception, semantic encoding, storage, retrieval, response formulation, and performance and are related as shown in Figure 1.

Furthermore, Gagné has hypothesized that there are external events in the learner’s environment, that can trigger or cue the internal events, and thus facilitate learning. The relationships that seem to exist between the internal processes of learning and the external events that elicit the internal processes have implications for instructional designers because they provide a conceptual base on which to select and sequence stimuli that constitute the instruction (Gagné, 1977). The purpose of this paper is to operationalize this theoretical foundation as a component in the instructional design process.

As has been said so many times, by so many authors, before we can begin to design instruction we should define the results we want it to produce. To this end we have the technology of behavioral objectives. In addition we have the technology of instructional analysis, or task analysis, the purpose of which is to describe the interrelationships among the enabling and terminal objectives of a unit of instruction. Briggs (1970), Gagné and Briggs (1974), and Wager (1976) have operationalized these processes congruent with Gagné’s Domains of Learning. After the objectives have been described and the sequence of instruction for teaching these objectives has been established, the designer can begin to plan the instructional stimuli as a set of external instructional events. These events will follow a logical order, as they relate to the internal events of learning, and the objective being taught during the period of instruction.

Gagné and Briggs (1974) list nine events of instruction. They are:

1. Gainning attention.
2. Informing the learner of the objective.
4. Presenting the stimulus material.
5. Providing “learning guidance”.
7. Providing feedback about performance correctness.
8. Assessing performance, and
9. Enhancing retention and transfer.

Further, Gagné and Briggs note that these events do not necessarily have to follow this exact order nor is it necessary that all events be provided to all learners, for all learning tasks. The order shown is a logical order with regard to the internal events of the information processing theory shown in Figure 1, and furthermore, the more events that are provided, the more complete instruction will be. The following examples will show how the events are used while designing instruction.

At the simplest level we might have instruction aimed at a single teaching objective. A typical example might be a lesson in a consumer economics course with the objective, “The student will demonstrate the calculation of the arithmetic average of a set of numbers.” It is assumed that a task analysis has been performed and that the designer realizes that prerequisite entry skills of addition, subtraction, multiplication, and division are needed in the new task. (It is also assumed that the majority of learners possess these entry skills.) At this point, the designer can turn his attention to the materials, determining whether or not they possess the necessary stimuli to produce instruction that meets the objective and is functionally...
complete with respect to the information process model. This is done on a media analysis worksheet. (See Figure 2.)

For example, Event 1, “eliciting attention and motivation,” is accomplished by the classroom teacher convening the class and giving them the context into which the day’s objective fits. This event could also have been accomplished by presenting the learner with a hypothetical problem that would call for application of the new skill for solution. Notice that in this example, a formal classroom learning environment was assumed; the process is as helpful in lesson planning for live instruction as it is in designing mediated instruction. The ingenuity of the teacher or instructional designer will be reflected in the interpretation of the events and the prescriptions for the stimulus materials. Each of the other events is listed on the left of the worksheet and the stimuli, media, and prescriptions are attended to for each event. The designer may omit an event if he feels it is not necessary to the task or for a particular audience.

It is often the case that the designer will attend to multiple objectives in a

### MEDIA ANALYSIS WORKSHEET

**CONSUMER ECONOMICS COURSE**

The student will demonstrate the calculation of the arithmetic average of a given set of numbers.

**UNIT # SPECIFIC OBJECTIVE NUMBER**

**INSTRUCTIONAL SEQUENCE NUMBER**

<table>
<thead>
<tr>
<th>Event</th>
<th>Stimuli</th>
<th>Media Alternatives</th>
<th>Tentative Media</th>
<th>Rationale</th>
<th>Prescription</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Attn/ Motivation</td>
<td>written word spoken word</td>
<td>text</td>
<td>live teacher</td>
<td>Instruction conducted in the classroom, teacher available and expected.</td>
<td>Relate the need for being able to find averages as an important step in budgeting. Give an example of a variable expense that must be averaged, e.g., gasoline for the car.</td>
</tr>
<tr>
<td>2. Present Objective</td>
<td>same</td>
<td>same</td>
<td>blackboard</td>
<td>Students can copy it down in their notes—reduces ambiguity that could result from an oral statement. Available.</td>
<td>Write the objective on the board.</td>
</tr>
<tr>
<td>3. Recall Prerequisite</td>
<td>same written symbol</td>
<td>same pretest</td>
<td>pretest</td>
<td>Written performance of the student can diagnose weaknesses in math.</td>
<td>Present a small but reliable set of multiplication and division problems. Detect problems of addition and subtraction from these problems. This test is to be analyzed after the rest of the instruction has taken place, since the learner could still benefit from learning the order of operations relating to the objective.</td>
</tr>
<tr>
<td>4. Present Stimuli</td>
<td>same written symbol</td>
<td>blackboard transparency handouts</td>
<td>teacher blackboard</td>
<td>A problem can be developed from class input, get class involved.</td>
<td>Teacher asks each class member to estimate how many cups of coffee they drank during the day. List the estimates on the board. (If coffee is not appropriate, use water.)</td>
</tr>
<tr>
<td>5. Provide Guidance</td>
<td>concrete-visual image spoken word written word symbols (numbers)</td>
<td>blackboard teacher other students JP AID (plus text)</td>
<td>teacher blackboard other students</td>
<td>This is probably a procedure familiar to a few of the students in the class. They can contribute here. Concrete visual image will aid encoding.</td>
<td>Ask if anyone knows the first step. Perform on board example. Second step, etc. Draw three steps on board label each from the bottom up: 1) add quantities; 2) count the number of quantities; 3) divide sum by no.</td>
</tr>
<tr>
<td>6. Elicit Performance</td>
<td>written word spoken word</td>
<td>handout teacher pencil/paper</td>
<td>teacher blackboard pencil/paper</td>
<td>Teacher can give oral directions and written problem on the board. Each student can write a problem the teacher can later review.</td>
<td>The teacher tells the students to figure the average amount of coffee he or she drinks in a week (Sunday through Saturday). Teacher solves the problem on the board putting up figures that are hers/his and solves the problem using the three steps. Students exchange papers and check each other’s answers.</td>
</tr>
<tr>
<td>7. Feedback</td>
<td>written word spoken word</td>
<td>teacher blackboard</td>
<td>same</td>
<td>Teacher provides a generic model. The accuracy of each student’s answer in terms of procedure is evaluated by student.</td>
<td></td>
</tr>
</tbody>
</table>

Figure 2. Sample media analysis worksheet.

Fall 1978, Vol. 2, No. 1
single instructional presentation. In this case, it is necessary to think about how the events will be sequenced and integrated for all of the objectives. To do this a sequence worksheet similar to that shown in Figure 3 can be used.

This particular worksheet outlines a 35-minute period in which three objectives are to be attained by the learners (numbers 6, 7, and 8 listed on the left). The boxes in the objectives/time matrix show the number of the event and its relationships to other events. In this case, for example, Event 1, "attention and motivation," is to be taken care of in the first 3 minutes of instruction. It is also the case that the stimuli presented here are to serve that event for all three objectives at the same time. The second set of stimuli are to attend to “presentation of the objective” (Event 2), and the third set of stimuli will serve two functions: Event 3 for objective 6 and Event 9 for Objective 3 (taught in a previous lesson).

Events 5, 6, and 7 are shown grouped together for Objective 6 since the student is asked to go through several iterations of the classify/feedback process in the learning guidance event. This is not true in Objectives 7 and 8 where learning guidance is scripted as an independent event. The sequence worksheet shows that in Event 8, Objectives 7 and 8 are conducted simultaneously, as is the case in Event 9 for all three objectives. The grouping of events for a particular objective is reflected in the prescription section of the media analysis worksheet. For example, the prescription for Objective 6, Events 5, 6, and 7 reads: "Present a list of resource types and a list of common resources. Ask participants to match resources and types and to indicate appropriate units of measurement. Provide answer key; have participant check accuracy and reconsider answers to be found in error.” That is, this prescription has combined some of the elements of learning guidance, eliciting performance, and providing feedback.

The process of media analysis by events was first developed by Leslie Briggs in his well known Handbook of Procedures for the Design of Instruction (1970). The additional development of theory and technology relating to the events of instruction following that publication has been the stimulus for the elaboration of this process as described in this paper. In addition to its utility to the designer as a tool of media analysis and materials design, it has potential for those doing research in theory development, media use, and materials evaluation. As mentioned in the beginning of this paper, it is probably the case that some learners can benefit from less complete instruction, i.e., certain events may be omitted from the stimulus materials without seriously affecting the effectiveness of the instruction. Perhaps efficiency and motivation are related to the number of and types of events included in instruction. The events might also serve as a means to analyze potential media effectiveness based on the media's capability to provide the event. (For example, broadcast television has very limited capability for providing feedback. To the extent feedback is necessary its effectiveness will be decreased.) The events could provide a tool for the analysis of existing instruction and its functional completeness. At this point there is very little empirical data or research relating to the events of instruction and how they affect the design of instruction.

References


### Figure 3. Sample sequence worksheet.

<table>
<thead>
<tr>
<th>Cumulative Time</th>
<th>2</th>
<th>4</th>
<th>6</th>
<th>8</th>
<th>12</th>
<th>16</th>
<th>20</th>
<th>24</th>
<th>28</th>
<th>30m</th>
<th>34</th>
<th>38</th>
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### Probable Length of Instructional Events and Lesson in Minutes
The vocabulary of instructional design is varied, sometimes vague and often personally interpretive. For example, let's look at the titles of different kinds of teaching models. Do you suppose we could arrive at agreement as to how these models differ?

1. Group Investigation Model
2. The Jurisprudence Model
3. Social Inquiry Model
4. The 7-Group Model
5. Study-of-Thinking Model
6. An Inductive Model
7. Inquiry Training Model
8. Development Model
9. A Model for Creativity
10. Classroom Meeting Model

Many of us could arrive at a general agreement, but what happens to that agreement when we design the instructional strategies? And, is there any way to scientifically compare or differentiate these models with one another? The nonspecific nature of these titles is representative of the methods by which they are identified.

One of the attempts to quantify this instructional process has been the development of the so-called system approach. Figure 1 illustrates the system approach.

As system designers who write and teach these kinds of things, we often stress the component relationship and omit the decisions required in the application of the principles of learning. That is, skills such as writing, objectives or conducting formative evaluation or constructing a learning hierarchy are skills readily learned. But skills involved with the design of instructional strategies demand a working knowledge

The system approach is the compartmentalization of differentiated functions whereby each component of the task incorporates the operationalized characteristics of input-process-output variables. It is also synergetic and cybernetic in nature. Here is a typical system model.

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Figure 1. A definition of the system approach. (From *The Systematic Design of Instruction* by W. Dick and L. Carey, 1978. Copyright 1978 by Scott, Foresman and Company. Reprinted by permission.)
of psychological constructs and their appropriate application for a predictable domain of learning.

Teachers often learn this skill after years of practice through trial and error. Even after they have developed highly successful skills, the information is not published or shared with other teachers and designers because there is no common language that eliminates ambiguity of idiosyncratic methods.

Instructional design flowcharts which depict the interrelations of major activities in the design of instruction have served designers well but in a limited way.

First, most system models had their genesis in computer or hardware technology, which may inadvertently have lessened the social aspects of instruction (that is, the incidental attitudinal outcomes which always accompany instruction).

Second, most system models were originated to facilitate the design and production of instructional materials. Therefore, many system models do not address the larger systems to which development of materials is a central, but small part. The larger systems include staff training, administration, management, and diffusion and instructor roles as shown in Figure 2.

Third, material development flowcharts act as procedural guide posts in material development, but they rarely reach the point of specificity whereby they help the designer in making student prescriptive decisions. Student prescriptive decisions are those decisions where the designer combines the principles of learning (arousal theory, reinforcement theory) to levels of learning (cognitive, affective, psychomotor) for a specific target population (age, IQ), with individual constraints unique to that group (large class, urban-rural setting). For example: How would you differentiate the teaching or design of instruction, if you wanted the students to exhibit problem solving behaviors, concept learning behaviors, memory behaviors, motor skills behaviors, or even attitude change behaviors? I am sure you can define these behaviors, but where are the instructional strategies to bring about those kinds of changes in student learned behaviors?

Where are the models that help us make those decisions? Where is the notation and the language system that will allow us to compare one instructional approach to another approach? This question leads into the major thrust of this paper: scientific notation of the instructional designer's decision is possible and currently in practice. It provides a means of noting the form and substance of the interaction between the instruction and the student.

In the early 1970's Dr. David Merrill at Brigham Young University began to operationalize the instructional design process with the encouragement and support of research by his staff and graduate students. The task was an exciting one, and very soon others recognized the potential impact of such an analysis and operationalized approach, and they joined with Dave Merrill.

They recognized that once the instructional design process was quantified through a notation system, communication between scientist and designer would be possible. For one of the first times, a clear, unambiguous, parsimonious statement could be written which in fact reflected the designers' decisions in designing instructional strategies.

Here is a nonexample of scientific notation, probably seen by most of us. In this description of a teacher in the classroom. The teacher:

- Calls the class to attention,
- Informs the learner of the goal for the day's activities,
- Presents materials,
- Provides guidance, and
- Evaluates student responses.

There may be many instructional supervisors who might rate that teacher high because so many of the right things were present (for example, attention, stating objective, guidance, and evaluation).

Here is another nonexample of scientific notation in instructional modules. They also have a system, but with little specific rationale vis-a-vis strategies. Once the objectives are stated, the strategy falls into the cycle of:

- Presentation of Information,
- Practice with information, and
- Evaluation of learner response.

In both examples, the process embodied in such strategies as informs learner, presents information, provides guidance, practice with information, becomes lost because of the ambiguity.

The teacher/designer wrestles with defining the interactions and manipulations of content and presentation for the purpose of obtaining predictable learner outcomes.

From the instructional designer's position there are two fundamental questions. (1) What is to be taught? (2) How is it to be taught?

Question number one is often influenced by persons other than the designer (for example, school boards, curriculum committees). Therefore, the notation system developed by Merrill and others concerns itself with "How something is taught," that is, the science of instruction—the principles of instruction as opposed to the principles of learning.

The principles of instruction operationalize the cause-effect relationship between learning theory and learner outcomes. The application of the operationalized principles of instruction may be viewed as the technology of instruction. Technology develops ways of using the principles. Before describing the notation system let's place the value of this process in perspective. That is, where in the major classes of instructional variables is this notation system having impact?

Figure 2. The expanded scope of the system approach.
The Merrill/Boutwell notation system speaks directly to the organizational strategies (Figure 3) variables and operationalizes the cause-effect relationship between learning theory and learner outcomes.

Functional notations:
\[
\begin{align*}
E & = \text{Expository (telling)} \\
I & = \text{Inquisitory (asking)} \\
G & = \text{Generality} \\
\text{eg} & = \text{example} \\
\text{eg} & = \text{nonexample} \\
\text{al} & = \text{algorithms} \\
\text{ai} & = \text{attribute isolation}
\end{align*}
\]

Instances

These seven functions define the relationship between content (what is being taught) and presentation (how it is being taught).

Fundamentally, each display originates from the simple two-by-two factorial shown in Figure 4. Any particular instance of a complex cognitive instructional presentation must always feature some combination of presentation mode and content mode. There are many combinations of possible displays, especially when mathemagenic information is included. The next paragraph provides an example of the notation system discussed.

Imagine a junior high school teacher preparing a science unit dealing with factors affecting the weather. The teacher's objective is to have the students reach the classification level of learning. To reach the classification (concept) level, the students must be tested with unencountered instances of the concept (that is, novel to the student.) The appropriate selection of the teacher design strategy can be seen in the following set of symbols. This list of symbols will, in a very limited space, convey more meaning and accuracy with less ambiguity than pages of prose. The teacher's strategy for concept learning follows.

Concept: \( E, XE, 3d \uparrow Ee, E \text{ eg}, E \text{ eg} \text{ eg}, \text{ eg} / \text{ egm}, (-Ee / \text{ egm}), \Delta d / m \)

This lesson strategy describes a concept treatment that consists of the following display elements.
1. \( E \) — an expository presentation of the definition.
2. \( XE \) — an expanded generality which further defines the concept, perhaps with a paraphrase or metaphor.
3. \( 3d \uparrow Ee \) — a series of three divergent exemplars arranged in ascending dif-

### Figure 3.
A model showing the major classes of instructional variables and the major interrelationships among those classes. (From "A Knowledge Base for Improving our Methods of Instruction" by C. M. Reigeluth and M. D. Merrill, Educational Psychologist, in press. Reprinted by permission of the authors.)

### Figure 4.
The origin of displays.
Here are the definitions of generality, example, and nonexample.

\[ G = \text{Generality, rules, concepts} \]

Generalties are used to present the specific information to be learned in that unit of instruction. They are brief and if fully understood by the student, the objective should be met.

- What type of content is usually included in generalization? Generalities contain at least one of the following:
  1. A list or statement of what is to be memorized,
  2. A definition of the concept,
  3. A statement of the principle,
  4. A listing of the steps in performing a psychomotor behavior.

- What is the purpose of generality elaborations?
  
  Generality elaborations are used to further explain the generality. They are necessary for students who do not fully understand the generality or terms therein.

- What type of content is usually included in generality elaborations?
  
  Generality elaborations can contain:
  1. A restatement of the generality;
  2. An analogy, algorithm, or mnemonic;
  3. A rationale for the generality.

\[ \text{eg = examples} \]

Examples are instances of a concept and the application of a procedure or a principle; all examples of generalities contain all the critical attributes necessary for class membership.

\[ \text{eg = nonexample} \]

In a nonexample, one or more of the critical attributes is missing.

There are other functions in the total process, but they tend to embellish rather than define the relationship. Those other functions are:

1. Mathemagic information—additional or augmented information provided to facilitate learning. Examples would be an expanded generality, cues, and prompts.
2. Quantitative functions
   A. Sequence
      1. Order, which display comes first
      2. Sequence, what is the pattern of the display
      3. Simultaneous versus sequential display
   B. Quantity
      1. Number (how many displays)
      2. Ratio (what displays in what proportions)

\[ \text{Figure 5. Instance difficulty.} \]

Figure 6 demonstrates the research applicability of the notation system. The two sheets of Figure 6 represent a
review of research completed by David Merrill (1976). Using the variables listed in the notation system as his guide, Merrill reviewed and compared research studies which demonstrated the superiority of one instructional variable over another. For example, the first comparison is between a control group (C) and an expanded generality (EC) and was reported by Klausmeier and Feldman (1975). (This study and all of the research studies listed in Figure 6 are listed in full in Merrill, 1976.)

Conclusion
The future of the systems approach to instruction is assured because of its proved effectiveness and efficiency. The adoption of a notation system that is generalizable to all instructional designers will allow and encourage a common communication base. Once a designer decides to use the notation system, the display sequences will probably be a heuristic approach (trial and error). As the more successful sequences become apparent they will become established.

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**Figure 6. Comparison of primary presentation forms with control groups (sheet 1 of 2). (From Technical Report No. 3 by M. D. Merrill, 1976. Copyright 1976 by Courseware, Inc. Reprinted by permission.)**

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NOTES:
Unless dictated by ns, all vertical differences are statistically significant.

*When the % correct could not be determined, raw scores were plotted relative to each other but arbitrarily positioned on the coordinate axis.

% of students correctly solving all posttest problems.

*Klausmeier and Feldman had 2 EG Eeg groups. One group had 3 times as many eg's as the other.

*Number of practice problems used by the student to reach criteria is plotted here.
Figure 6. Comparisons of primary presentation forms with control groups (sheet 2 of 2). (From Technical Report No. 3 by M. D. Merrill, 1976. Copyright 1976 by Courseware, Inc. Reprinted by permission.)

NOTES:
Unless indicated by ns, all vertical differences are statistically significant.

*When the % correct could not be determined, raw scores were plotted relative to each other but arbitrarily positioned on the coordinate axis.

% of students correctly solving all posttest problems.

*Several dependent variables were used. The number of examples used by the student to reach criteria is plotted here.

*Klausmeier and Feldman had 2 EG Eeg groups. One group had 3 times as many eg's as the other.

*Number of practice problems used by the student to reach criteria is plotted here.

14
Descriptors of Evaluations in Instructional Development: Beyond the Formative-Summative Distinction

Earl R. Misanchuk
University of Saskatchewan
Saskatoon, Canada S7N 0W0
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As the field of instructional development (ID) emerges and grows, it is of fundamental importance that practitioners in the field be able to communicate completely and fully with one another—to share plans, experiences, and outcomes; to consolidate the knowledge base regarding the efficacy of various practices. Instructional developers need not be reminded of the importance of full and complete communication, and the potential problems inherent therein—most of them deal with that very problem on a day-to-day basis.

This paper focuses on communication problems caused by the vocabulary associated with evaluation in ID projects (that is, the terms "formative" and "summative").

A complete description of an evaluation ought to include answers to the same basic questions that a good news story does (Figure 1). Most descriptions of evaluations do explicitly or implicitly

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Figure 1. Functions of descriptors of evaluation. The sets of terms describe the why, the when, the how, and the what of an evaluation.
inform the observer who is doing the evaluation, and where it is taking place. In this paper, I will suggest a third dimension, confirmative evaluation, that will add information regarding the why of the evaluation, and also, incidentally, the where, since formative evaluation takes place during development, summative evaluation after development, but before implementation, and confirmative evaluation after implementation. The heuristic-algorithmic dimension attends, as does the determinate-indeterminate dimension, to the how of the evaluation, by providing detail regarding the procedures and data types used in the evaluation. Finally the achievement-accomplishment dimension addresses itself to the question of what kind of outcome or behavior is under scrutiny.

**Formative and Summative Evaluation**

Since their introduction by Scriven (1967), the terms “formative evaluation” and “summative evaluation” have so thoroughly permeated the field of education and extended beyond into the fields of health and social action programs, that they have become commonplace. Along the way, their meanings have sometimes assumed different shades than those originally proposed by Scriven: diffusion of the concepts of formative and summative evaluation seems to have had a concomitant of a blurring of the concepts. To illustrate, we have heard of administrators requesting “summative” evaluations of unique, nonreplicable learning events. Can the definition of a summative evaluation really be expanded to include the evaluation of “one-shot” happenings? Not without grossly distorting the meaning of the term as originally defined by Scriven.

Nor are professional evaluators free of responsibility for the blurring and misunderstanding of evaluation concepts: Bloom, Hastings, and Madaus’ (1971) adaptation of Scriven’s product-oriented terms to describe evaluation of student achievement of enabling objectives (which they called formative) and terminal objectives (summative) probably does as much to confuse as to clarify the use of evaluation terminology.

I propose that the terms “formative evaluation” and “summative evaluation” have been adequately defined by Scriven and are, in themselves, perfectly serviceable terms. Abuse of the terminology, however, has led to imprecision in communication, and I think it behooves us to rectify the problem by ensuring that the terms, and others like them, are applied only in those situations where they fit. If it arises that a kind of evaluation must be discussed which hasn’t a name, it seems more reasonable to define and name it than to try to extend the definition of an existing term beyond its scope.

**Dichotomy or Trichotomy of Evaluation Roles?**

In instructional development projects, evaluation situations occur that are neither fish nor fowl. For example, imagine that a curriculum developed either locally or elsewhere has been adopted, and some time after its implementation, it is discovered through a process of evaluation that the curriculum must be modified somewhat to meet current local needs. Is the evaluation that might turn up such a finding a formative evaluation or a summative evaluation?

The formative-summative description set ought to be expanded to include a third element, confirmative evaluation, that would describe that kind of an evaluation that is done on a product of an instructional development effort (be it a curriculum, a program, a set of learning materials, or whatever) that has been put into practice for a period of time and is now up for review. That is, the product, which has been the subject of formative evaluations, and possibly of a summative evaluation, has been in operation for some time and the question now to be answered is “Should the product be maintained as is, changed in some way, or discarded completely, with or without replacement?”

Confirmative evaluation is sufficiently different than either formative evaluation or summative evaluation to warrant a designation of its own. First, consider the matter of timing. Formative evaluation is performed while the product is under development (that is, before it is finished), summative evaluation is performed after the product is finished, but before it is widely adopted and implemented; confirmative evaluation is performed after the product has been implemented and used for a period. Second, consider the question of who is most likely to be able to perform a credible confirmative evaluation. Formative evaluation is best performed by an evaluator who is intimately involved in the development process; summative evaluation is best performed by an evaluator who is sufficiently removed from the project to be able to be objective and unbiased; confirmative evaluation requires something of both evaluator roles. To make the first decision of the three-stage hierarchy (see Figure 2) requires the dispassion of a summative evaluator, but to make the next two decisions requires the involvement of a formative evaluator. Perhaps a team effort is required for proper confirmative evaluation. Only further experience with conducting confirmative evaluations will produce the needed guidelines. In any event, confirmative evaluation is clearly different than either formative or summative evaluation, both in its role and, consequently, in its demands.

The problem of precision in communication about evaluation in instructional development does not end with cleaning up the use of the formative-summative-confirmative distinction. I submit that there is need for an expanded vocabulary of evaluation, especially in instructional development contexts. Let me illustrate that need with a couple of examples of evaluations in ID projects.

**Example Case No. 1.** Consider the evaluation of a human geography course (Schwen and Keller, 1977; Schwen, Keller, Backler, and Jones, 1974) which involved, among other things, measures of student achievement, lesson by lesson accumulation of student opinions with respect to several course components, and what Schwen and his colleagues termed a “follow-up evaluation” (1977, p. 33) which attempted to evaluate whether students were able to “think like geographers”. The achievement tests were of the classic type, and the opinions on course components were collected from the 150 students primarily by Likert-type questionnaires. The data collected were therefore numerical in nature. The object of the evaluation, the human geography course, while relatively innovative in its format (autotutorial laboratory, large group sessions, and discussion sessions), was pretty much a known quantity in the sense that university courses have long and often been the subject of evaluative scrutiny. For the most part, the data collected dealt with how well the students had learned the material presented in the course. A final assignment on the applications phase of the course, in which students were asked to use raw data and journal articles to demonstrate their ability to apply the concepts, principles, and skills taught in the course, was also present.
Q1: Discontinue program?

Yes / Discontinue

No

Q2: Replace with another?

Yes / Create new program

No / Q3: Revise program?

Yes / Revise

No / Retain intact

Example Case No. 2. In the second instance, consider the type of formative evaluation most of us practice when developing new products involving innovative formats or structures (for example, see Baker, 1974, 1977; Markle, 1967): the evaluation consists largely of placing a single student into the instructional situation and observing as he or she proceeds through the prescribed learning sequence, then discussing his or her experiences, noting areas of difficulty or confusion. Although the process might be repeated with two or three students, it is generally performed with one learner at a time. The data collected are descriptions of specific points or generalizations made by the students, and nonparticipatory observations made by the developer/evaluator. The form of the evaluation is relatively familiar to instructional developers in the sense that most of us have done this procedure many times and have developed a more or less standard approach to the experience that may well vary somewhat in response to the particular situation, but is generally of similar format from instance to instance. Most frequently, the data collected will not be recorded in formal form (often they are simply notes in the margin of the prototype); seldom are the data numerical. Typically, the data collected deal with how quickly and easily the students are able to master the material presented (that is, some sort of more or less formal criterion test on the taught material forms part of the data collection).

Example Case No. 3. Now consider still another example of a formative evaluation, in which I was involved recently. The evaluation problem had to do with determining whether the process by
which development personnel were arranged and managed on a particular project was an effective one. The evaluation was formative, in the sense that the outcomes of the evaluation would be used to guide future decision-making on the pattern of ongoing deployment of human resources in the development project; it was also unique in the experience of the evaluator and the subjects of the evaluation. While there is a rich pool of information with respect to using pencil and paper instruments to collect evaluation information in numerical form and analyze such data and even at least minimal suggestions on how to conduct the single-student feedback evaluations described in the second example, there seemed nowhere to turn for specific help in designing and implementing the type of evaluation described here. The situation was relatively novel, and there was little precedent available to draw upon. In terms of the focus of the evaluation, the behavior of the principal actors in the process was the object of scrutiny; it was not enough to know that each participant in the development project knew what the development and management models in use were and how they operated—they had to abide by them in practice to judge the trial successful.

The type of evaluation described in the three examples is formative, yet the nature and scope of the evaluations varied widely. Simply to describe all three evaluations as formative evaluations leaves a great deal undescribed. With an enlarged vocabulary pertaining to evaluation, we could describe the evaluations much more fully and richly, while retaining verbal parsimony.

Descriptors for Evaluations

For example, Davies and Schwen (1972) suggested the terms heuristic and algorithmic, and determinate and indeterminate to describe evaluations. The first of these two descriptive continua refers to the form or the how of the evaluation. Evaluation is heuristic if it is novel, unstructured, or consequential and involves no standardization, conventional, or agreed-upon approach. Algorithmic evaluation involves the application of established or standardized procedures, with little opportunity for deviation. The second set of descriptors, determinate and indeterminate, refers to the kind of data used to guide decision-making in the course of evaluation. Determinate evaluation decisions are typically based on numbers and are objective, analytical, and frequently computational in nature. In other words they use so-called hard data. Indeterminate decisions are typically based on the more subjective sources of intuition and experience (that is, so-called soft data).

I suggest that the substance, or the what, of the evaluation can be described in terms of acquisition evaluation and accomplishment evaluation. The former term refers to situations where the evaluation is designed to determine the amount of learning that has occurred; the latter term refers to the evaluation which, while incidentally determining the amount of learning that has occurred, goes on to determine also whether or not the learned knowledge has sufficient social utility to the learner that he or she has put it into practice.

Using these three sets of terms allows us to differentiate rather better among the three examples of formative evaluation given earlier. The evaluation of the instructional development process that formed the basis of the third example could be described as heuristic (the situation was novel and unstructured, and suggested no standardization, conventional, or agreed-upon approach to the evaluation), indeterminate (decisions would be based on subjective data), and focused on accomplishment (the integrated practice of the process was the focus of the evaluation, not just the knowledge of the process). The new product evaluation described in the second example could be characterized as algorithmic (most of the process follows an established procedure), determinate (the judgments are based on nonnumerical, relatively subjective data), and focused primarily on acquisition (that is, how well the student learned the material presented). The evaluation of the human geography course in the first example was algorithmic (data collection was very structured), determinate (almost all the data involved were numerical), and acquisition-oriented (that is, primarily focused on the learning of the subject matter).

(The applications phase assignment in the human geography course evaluation attempted to get at a demonstration of use of the knowledge, skills, and concepts taught in the course, but the very fact that the demonstration was required under the circumstances of a formal assignment moves the evaluation from the category of accomplishment to that of acquisition. Accomplishment evaluation can only take place when there are no inducements to demonstrate use of the knowledge except the availability of the knowledge and the judgment of its applicability and efficacy.)

The Necessity for Descriptors

While it may be that, say, the new product evaluation process in the second example is less algorithmic than the human geography evaluation process (that is, there is more opportunity for and more likelihood of variation in the data-collection process), it is at least meaningful to speak of the characteristics of the two evaluations in relative terms, by referring to their positions on the algorithmic-heuristic continuum.

There will be those who argue that the field of education needs less jargon, not more; that considerable obfuscation occurs as a result of using jargon, I must admit that I frequently encounter examples of poorly constructed communications (including those of my own creation), and am therefore sympathetic to the point. However, it seems that far more frequently I encounter situations in which terms are misused or inappropriately applied for want of an appropriate term. There seem to be only two solutions to the problem: either a fuller description must be provided, using lay terms, to give an accurate description; or parsimony may be maintained by defining terms with specific meanings to fill the gap. It is in the spirit of the latter solution that I have written this paper.

The terms formative evaluation and summative evaluation are very useful for describing the roles of evaluations. By themselves, however, they are insufficient, to the extent that there are other characteristics of evaluations that ought to be described for interprofessional communications. Indeed, the formative-summative distinction does not cover all the available ground in the context of instructional development, thus I have suggested that the term confirmative evaluation be added to the original dichotomy. Similarly, I have here reiterated the Davies-Schwen suggestion that the terms heuristic or algorithmic, and determinate and indeterminate be used to describe evaluations, and have suggested that the terms accomplishment and acquisition also be used.

References

Evaluation Technology in Instructional Development

Robert D. Tennyson
Curricular and Instructional Science
University of Minnesota
Minneapolis, MN 55455

Instructional development involves the systematic application of instructional and learning principles and theories to the planning and implementation of learning environments. Whenever possible, it uses interdisciplinary research and theory to aid in the understanding of variables that contribute to the development of effective instruction. Information from related fields of inquiry has helped to specify optimum conditions for learning as well as provide efficient ways for planning the learning that is to take place. Psychology, computer science, management information sciences, and educational technology have contributed to the definition of a set of prescriptive variables which can be applied systematically to the development of instructional materials (Glaser and Resnick, 1972).

The systematic application of these prescriptive variables can be expressed as a model for planning and implementing instruction. Since Glaser's (1965, 1966) original model for instructional development, a number of others have appeared (for example, Briggs, 1970; Gerlach and Ely, 1971; Kemp, 1971; Merrill, 1971; Popham and Baker, 1970). Most of the activities represented in these models—behavioral objectives, test, instructional activities, posttest and revision—are familiar to educators. Most of the newer instructional models (for example, Dick and Carey, 1977), even with their increased complexity and decision strategies, offer the same general characteristics.

With this in mind I am presenting another model of instructional development but rather than characterizing it by the usual boxes and arrows of a flowchart, this model identifies the principles and theories associated with the process of instructional development. The assumption made here is that with each application of these principles and theories, a unique sequencing (perhaps as a flowchart, but not necessarily) of the development activities will be produced. Another difference between this model (Figure 1) and earlier models is that evaluation is included in every phase of development (Tennyson, 1976). As noted above, evaluation has been relegated to the last step in the process—this has usually occurred because of the limitations of flowchart techniques to describe the complexity of both development and evaluation.

The model used to identify the generic prescriptive variables has four phases: assessment, design, production, and implementation (see Figure 1). Within each of these phases are two main activities, development and evaluation. Additionally, the model includes reference to products associated with each phase. As a description of the model, development and evaluation activities will be reviewed and suggested for use. It is assumed, however, that each developer will define his or her own specific strategy of development based upon an analysis of their particular situation. This is a descriptive model to aid in instructional development; it is not intended to be restrictive.

Assessment Phase

Instructional development usually begins with an assessment of the learning environment to determine if an instructional need or problem exists (Merrill and Wood, 1975). The environment is assessed to provide data to answer the question: Would an instructional development effort be feasible and desirable? This activity defines the conditions and parameters of the problem from which specifications for the instructional development project can be proposed. The procedures and findings of the assessment phase are evaluated to determine whether to adopt currently available instructional materials, modify existing instruction, or develop new instructional materials. If either the second or third option is selected, the instructional development would continue through the remaining phases (Figure 1). However, selection of the first option—to adopt—would require only the implementation phase.

The assessment phase involves two concurrent processes: (1) specification of the instructional problem, learner characteristics, situational variables, and instructional objectives, and (2) evaluation of the assessment process and its results to determine the feasibility of adopting, modifying, or developing instructional materials.
Figure 1. Phases of instructional development.
Specifications and Feasibility Evaluation

An instructional problem is usually assessed and defined in terms of curriculum needs and goals (Taba, 1962). This relationship of instructional development to curriculum development, however, is a fairly recent phenomenon (C. Tennyson and R. Tennyson, in press). The concern for instructional and curriculum problem identification is directly related to federal support for schools. Since the implementation of Title I, the Elementary and Secondary School Act of 1965, educators have had to develop detailed goals and objectives that were “behavioral, measurable, and representative of cognitive, affective, and psychomotor domains” to obtain federal funds. The original curriculum needs assessment procedures initiated a new emphasis in educational evaluation to accurately determine the goals and objectives of education. Space does not permit a complete review of the curriculum evaluation methods, but they have been well defined (Groeben, 1968; Phi Delta Kappa National Study Committee on Education, 1971; Prove, 1971; Stake, 1967, 1969).

Instructional problem. Assessment methods used in the specification of the instructional problem are still for the most part qualitative, but the trend is toward obtaining data from quantitative sources, for example, surveys, job analyses, competency analyses, and curriculum goal analyses. Such data can be acquired and interpreted by analyzing school curriculum, governmental educational policies, other governmental regulations (for example, affirmative action), community needs, societal concerns, and educational research and theory. The instructional problem assessment process should provide information that specifies the needed content and behaviors to be learned within a given segment of the curriculum. The first step in the feasibility evaluation process (Figure 1), is the validation of sources used to define the instructional problem. Literature in this area appears to be endless with much of it focusing on various data sources. Just a few of the primary sources include, for example, society (McClure, 1971), students (U.S. Office of Education publications, U.S. Office of Education, State plan administrator’s manual, ESEA, Title III, Washington, D.C.: The Office, 1971, p. 20.


Learner characteristics. Research has demonstrated that assessing the aptitudes and attitudes of the target population should be considered when instructional materials are being designed (Cronbach and Snow, 1977; R. Tennyson and Woolley, 1971; R. Tennyson and Routwell, 1973). The assumption is that learning can be facilitated if the instruction can be adapted to the aptitude of the individual learner. Likewise, learner attitude seems to be an increasingly important factor in the development of learning environments (Gagné, 1972). Evaluation of learner aptitude and attitude follows from the method of acquisition—actual collection of data from the target population or from literature sources (for example, Guilford, 1966; Piaget and Inhelder, 1969).

Situational variables. Before instructional objectives can be established, the resource and facilities of the learning environment need to be assessed (Davis, 1972). These include not only the instructional resources of the learning environment but also the resource capabilities (facilities, funding, and staff) for doing the instructional development. Davies (1973) emphasizes the need to maximize the instructional resources; however, constraints inherent in these resources must also be recognized. The concept of constraints implies both the physical limitations and the capabilities of the resources for facilitating learning. Analysis of the situational variables should provide information on the characteristics of the learning environment—that is, the potential learning and instructional capabilities of the available resources and facilities and the requirements for modification and development activities.

Another concern is the availability and organization of knowledge (King and Brownell, 1966). The purpose for attending to subject matter here is to bridge the gap between the curriculum structure and the content (or task) analysis done in the design phase (Figure 1). At this stage of development it seems sufficient to establish what subject matter is desirable and appropriate for attaining the curriculum goals and to leave the detailed content organization to the design phase (Klihr, 1976). Evaluation of this component is actually done concurrently with the instructional objectives.

Instructional objectives. The data obtained from the specification procedures are used to specify the instructional objectives for the learning environment. Objectives at this point in the development process define the intended content and behavior the student will demonstrate as a result of instruction, not performance on a posttest system of assessment. Evaluation of instructional objectives seems to be a qualitative activity requiring a continuous review and adjustment (Kapfer and Ovard, 1971). That is, the intelligence, insight, values, attitudes, and beliefs of those associated with the learning environment judge the validity of the instructional objectives.

Product

It is at this point that the decision can be made as to how to proceed in solving the instructional problem. One form of documenting this solution is the preparation of a proposal which states the rationale for the instructional development decision and the specifications for accomplishing the stated objectives (R. Tennyson, 1977).

Feasibility evaluation focuses on documenting both the validation of the assessment procedures and the rationale of the specifications (Prove, 1971); that is, complete information should be provided on how the data were collected, from whom they were collected, and what method of validation was used. Documentation should also demonstrate how the objectives directly relate to the specifications derived from assessing the problem, the learners, and the situational variables (Saylor and Alexander, 1974). An additional form of evaluation involves an analysis of the likelihood that a developmental effort would result in a product that justifies the estimated time and resource expenditures (Temkin, 1974). Currently, most cost-estimation procedures used in instructional development are designed for either summative evaluation or for continued use of a product (Silvern, 1972; Temkin, 1974). Applying the principles of cost benefit analysis, which include direct costs and learning effectiveness and efficiency, to this front-end assessment makes it possible to establish more precisely the costs of the development effort.

Design Phase

The second phase of instructional de-
development deals directly with the design of the instructional materials. Design is the area of instructional development that has received the most research and theoretical development, yet it is probably the least-used phase in instructional development. This paradox occurs because of the division between the researcher and the developer. The failure to apply research findings to development, however, is probably due to poor communication rather than the unwillingness of developers to use research findings. Publication of several books and articles by researchers on applied design considerations gives testimony to the growing recognition of this problem. One can cite, for example, Gage and Berliner, *Educational Psychology* (1975); Gagné and Briggs, *Principles of Instructional Design* (1974); Klausermeier, Chatala, and Freyer, *Conceptual Learning and Development* (1974); Merrill and Tennyson, *Concept Teaching: An Instructional Design Guide* (1977); and Snell, *Learning Theory, Instructional Theory and Psychoeducational Design* (1976). Furthermore, a review of authors in *Educational Technology and Journal of Instructional Development* would demonstrate that researchers are producing materials that explain design procedures in non-technical terms.

**Analysis and Formative Evaluation**

The analysis component of the instructional design phase bridges the gap between the general guideline specifications of the assessment phase and the actual development of the instructional materials (Figure 1). The tasks associated with this activity include analysis of the content and behaviors defined in the instructional objectives, construction of the learner evaluation materials, selection of management, design, and delivery strategies, and development of an instructional prototype.

In general, the purpose of formative evaluation is to obtain data necessary for making revisions and refinements of the instructional materials during the design phase (Figure 1). Refinement refers to adjustments within single elements of the instructional design (that is, content/behavior analysis; performance objectives; tests; and strategies for management, design, and delivery) which do not affect the other elements; revisions, on the other hand, refer to alterations in one element which produce changes in one or more of the other elements. Data used for making revisions and refinements are derived currently with each element of the design phase processes. Formative evaluation includes such activities as review of the content/behavior analysis by subject matter experts (SMEs), validation of the test and instructional sequence, a one-to-one tryout of the prototype materials, and finally a tryout of the materials in a simulated learning environment.

**Content/Behavior.** The design of instruction ultimately centers on the subject matter to be learned and the behavior required of the students toward that content. Such an analysis consists of determining the most efficient arrangement of that knowledge for purposes of learning (Simon and Hays, 1976).

Formative evaluation of the design phase usually begins with a review and critique of the content structure by subject matter experts. The scope and sequence of the subject matter for instruction (content structure) is typically determined by a consensus of scholars in that discipline. If the analysis of content and behavior has resulted in the alteration of the conventional content structure, review by subject matter experts usually helps to ensure the integrity of that content. This review process can be particularly useful in making refinements of the content structure, because learners are usually too naive to offer criticism. The techniques for conducting a content review are presented in several curriculum development sources (for example, Saylor and Alexander, 1974).

**Learner assessment.** Design of a learner assessment procedure follows the analysis of content and behavior. Learner assessment involves the construction of an instrument to evaluate the learner's achievement of performance objectives (Anderson, 1972).

Criterion for acceptable performance on the assessment instrument should be established once the test and instructional materials have been validated. Rather than allocating an arbitrary standard for criterion performance such as the often-assigned level of 90 percent, performance criterions should be based on realistic expectations derived from the target population's interaction with the instructional and testing materials. Implied here are two forms of learning criteria. The first as defined in the instructional objectives (assessment phase), identifies the behaviors to be exhibited by the student when completed with the learning environment—including both instructional materials and tests. The second establishes a level or levels of acceptable performance on the with-learning environment assessment procedures.

The learner assessment instrument should be validated prior to the development of the prototype instructional materials for two basic reasons. First, the instrument should be designed to evaluate student learning of the defined content/behavior area, not just to provide an assessment of student learning of the specific instructional materials. Second, validated test can be used for evaluating the structure (sequence) of the instructional content/behavior (Smithson, 1972).

**Instructional strategies (management, design, delivery).** A concern in the design of the instructional materials is the design of the management system (Figure 1). The management strategy design will of course depend on the size of the instructional development project. If only one course is being developed it is possible to have only one form of management strategy, but if several courses or even an entire curriculum are being developed the management strategy can include many options. The options available for the management system depend on the specifications for both the learning environment and the instructional materials.

The second instructional strategy—design—refers to variables used for sequencing and presentation format of the instructional material. It is also with this area that we find the most extensive research efforts. Because the scope of this paper prevents a detailed or comprehensive review of this area, I will only direct the reader to the following reviews: Frase (1975); Klahr (1976); McKeachie (1974); Trefrin (1977); and Wittrock and Lumsdaine (1977). The research findings seem to support Gagné's (1972) hypothesis of three basic cognitive behaviors: verbal information, intellectual skills, and cognitive strategy, each requiring a different design strategy for presentation of the instructional materials.

The delivery strategy should be selected with regard to the design strategy, the situational variables, and the management strategy. The variables and criteria in media selection models differ widely; most are technology oriented although a recent model by Merrill and Goodman (1972) recommends selection of media according to design, behavior, and resource capabilities. The flexibility in media selection models results from both the focus of the authors and the almost total lack of
empirical data on whether students learn better from one form of media than another. An additional factor that should be considered in media selection is the concept of transmedia: a transfer from the original medium to another medium form. The transmedia capability is a factor to consider with individual learner variables.

Development of prototype. The procedures for the development of an instructional prototype have gone through a series of changes as the result of applied development work rather than research findings. As the research on production variables advances, there will develop a more scientific approach to the actual development aspect of the instructional design process. Because empirical knowledge is lacking on this topic the evaluation procedures become important. Current understanding of the development process comes from clinical casework projects rather than true experimental settings, and as the development cases increase, certain variables and conditions will obtain a quasi scientific value. These casework projects have found, however, that an important element of efficient development is the formulation of a plan for administering the development process.

Additional elements to be considered in prototype development are message design (Fleming, 1970) and transmedia. These variables relate to the various ways in which a learner could perceive and interpret a message due to its presentation by a delivery system. Care must be taken to avoid misrepresentation. Once content is coded into a message on a delivery system, one-to-one and group tryouts can be instrumental in detecting any perceptual errors on behalf of the learner.

As in the other forms of evaluation, the purpose of a one-to-one tryout is quality control. Procedures for a one-to-one tryout are well established in the literature and involve the developer as the observer while the student attempts to work through the instructional materials (Bloom, Hastings, and Madaus, 1971; Cronbach, 1965; Eiss, 1972; Wiitrook and Wiley, 1970).

The purpose of the simulated tryout is twofold. First, information is obtained for making refinements of the materials prior to full production. Variables to be considered include pretest/posttest scoring patterns, confidence ratings, and learner time spent on the instructional materials. Second, posttest scores from the simulated tryout can be used to establish a criterion for student performance. That is, the criterion for a test is founded upon normative data if it is to reflect a reasonable expectation for a given population of learners. Learning from instructional materials can be inferred if a significant gain in student performance occurs between the pretest and the posttest. More extensive data interpretation beyond observation of score differences will result from using multiple forms of data (for example, pretest/posttest scores, confidence ratings, and learning time).

Product

The design phase concludes with the completion of the instructional product. This phase, like the others, uses evaluation heavily to help validate the procedures and products, but it also differs because of the extensive research which moves development towards a scientific activity. The two concluding phases, production and implementation, follow the pattern of the initial assessment phase. That is, there is minimal scientific research to support the procedures defined, and the evaluation activities serve as a raw empiricist approach, the scientific foundation of the two remaining phases is based upon case study evidence.

Production Phase

The purpose of this third phase of instructional development is to produce the instructional prototype for use in the learning environment. Packaging the instructional materials usually implies that someone besides the original developer will be using the product. In most instructional development projects the assumption is that the product will be design dependent rather than teacher dependent. The design dependent concept increases the potential market of users. The need for packaging and disseminating instructional materials to reduce duplication of effort has resulted in the establishment of several clearinghouses for instructional products dissemination.

Documentation of instructional materials in a systematic procedure started with the guidelines for programmed instruction issued by the National Education Association (1969). Those guidelines dealt with providing information on the rationale for decisions made in the design and included results of formative and summative evaluations. The original list still covers the main points for documentation of instructional development. Missing from those guidelines are the data and conclusion of the assessment phase, several components of the design phase, much of the information in a summative evaluation, and all of the implementation phase (Figure 1). Documentation standards now follow closely those established for research reporting and test construction.

Concurrent with the production of the instructional materials is the evaluation of those materials in the learning environment where they are to be used. The purpose of the summative evaluation is to document the degree to which the instructional materials meet the objectives of the instructional development effort. This evaluation centers on the degree that students learn the defined content and behaviors (R. Tennyson, 1977). Evaluation data for the documentation should include student performance reported in gain scores and compared with a control group, student learning time, learner attitudes, and costs. These data should be collected by presenting the instruction in the conventional learning environment, that is, as much as possible, the students should view the instructional materials as part of their normal learning experiences. The purpose here is to minimize the experimental effect that is present in the formative evaluation procedures.

Group comparison. Summative evaluation provides documentation that the developed instructional materials actually teach the content and behaviors defined in the instructional objectives. Gain scores (pretest/posttest) can be used here, but a more powerful method would be some type of multiple group comparison study in which the performance of students who receive the instruction is compared with the performance of students who receive some alternative instruction (R. Tennyson and Boutwell, 1972). There are variations of this control group design and many sources which illustrate them (for example, Merrill and Tennyson, 1977). This control group design can be useful in a summative evaluation if basic descriptive information on the control group is given in the documentation.

Determining the efficiency of the instruction is a second important purpose of summative evaluation. Only recently have developers actually attempted to collect this type of data, but most instructional development sources (for example, Gagné and Briggs, 1974; Davies, 1973) do not provide information on why or how to collect time data.
Efficient instruction can decrease the amount of time required for learning; make time available for additional learning; save money where productivity is a goal; and usually improve motivation. Time data can be collected simultaneously with effectiveness data. Basic time data would indicate (1) time necessary for directions, (2) time required for the different instructional units, (3) time required for outside study, and (4) total time required for learning the objectives.

Learner attitude toward the instruction seems to be gaining as much emphasis in evaluating instruction as efficiency and effectiveness (Doyle and Whiteley, 1974). The immediate problem is how to measure student attitudes in terms of conventional instructional methods. In the past, the most reliable form of student evaluation has been the single question, "How do you rate this instructor's overall teaching ability?" (Doyle and Whiteley, 1974). This question is not comforting or suitable when attempting to evaluate an instructional product. Attitudinal responses should be specific to the definable characteristics of variables of the instruction. Composite scores are rarely useful in assessing quality of the instructional product, so wherever possible attitudinal data should be collected from instruments and methods designed specifically to evaluate the instruction under development.

Calculating the costs of development and the estimated operation costs is usually the final component of summative evaluation. The purpose of this evaluation is to determine the "cost effectiveness" of the product (Collarela, 1975). The real costs of the instructional development are derived not only from the direct expenses of development but also from the expected life of the product and the level of student learning (Wilkinson, 1972). For example, an instructional product that may be considered expensive to develop might result in better learner performance than a less expensive product. The formulas available to calculate cost effectiveness have become increasingly sophisticated as most institutions have had to justify the high costs of initial development (Rodd, 1974). Documentation of costs should be provided in as much detail as possible, the same as for the other data collected in the summative evaluation. This would make it possible for a potential user to examine the costs and interpret according to his or her own perspective. Just as he or she would interpret the learning effectiveness data. Amortization of costs should always be a factor in cost evaluation. Instructional development costs are initially high and can be absorbed over the expected shelf life of the product or if sold commercially, by the number of units sold.

Product

At the conclusion of the production phase, the instructional materials can be put to use in the learning environment. In addition to the instructional materials a final development product should be the technical report. Just as researchers must define and elaborate their research methods in written form, so also should developers. Even if we have an incomplete science, we can still document how and why decisions were made, allowing the user the option on acceptability—just as in acceptance or rejection of research.

Implementation Phase

This final phase of instructional development is the implementation of instructional materials in the learning environment. The two parts of this phase involve implementing the instructional materials and managing an evaluation system that maintains the materials in relationship to the total learning environment.

Implementation and Maintenance Evaluation

If a new management system for the learning environment is developed in conjunction with the development of new instructional materials, then the management system should be installed prior to the introduction of the new materials. Davies (1975) maintains that the conditions of the management system need to be operational first to ensure that the various instructional materials components can function to their full capabilities. Too often new instructional materials lose their potential when the management system is not ready.

Evaluation of the learning environment after implementation of new instructional materials can influence the useful life of the materials. Maintaining the materials at or near the original level of effectiveness is the purpose of this final phase of evaluation. One of the first considerations in this area deals with the question: Are the instructional materials still worth using? In other words, do the benefits derived from the product justify the costs? Some of the benefits identified by Silvorn (1972) include such factors as learning performance, positive learner attitudes, and efficiency of the materials and the management system. Efficiency of the management system refers in part to the ability of the system to adjust to innovation and updates in the learning environment. An efficient management system should signal change that is required to maintain or even improve the learning environment.

Performance of the students during and after participation in the learning environment is an important source of data for maintenance evaluation. Student performance while in the environment provides immediate information on the degree to which instructional materials enable students to meet the objectives of the instruction. There are, however, two additional sources of data which can be used in this evaluation. They come from curriculum evaluation models and are usually referenced in connection with needs assessment procedures (Provis, 1971). The first is student performance in the succeeding instructional materials (that is, the student acquiring the appropriate behaviors necessary for entrance into the succeeding instruction). The second is student performance after transferring into a non-instructional environment (that is, is the instruction meeting the curriculum goals?).

Student attitudes toward the instruction may fluctuate according to changes in the student population. It is probable that student imposed instructional changes may occur if students enter instruction with different prerequisite skills and backgrounds than were anticipated during its development. Instruction itself can cause a negative student attitude if there are out-of-date visuals, poor photographic displays (for example, films and film strips), missing resource materials, or any other components of the system which do not meet the technical standards of the original product (Davies, 1973).

Another form of maintenance evaluation involves the updating of the content to keep the instructional materials current. Certain disciplines or subject matter areas are more susceptible to change than others; however, the user should establish and follow procedures to review the content for any possible changes. It is good evaluation practice to assume that changes will occur and that periodic changes in the developed instructional materials will be necessary. Likewise, the behaviors required...
in relation to the content should be reviewed for possible updating.

With the increased use of technology in learning environments, the technology must be evaluated and maintained as well as the courseware and software. Where possible, new media resources should be incorporated into the system to add to the management or delivery systems and to improve the efficiency and even the effectiveness of the learning.

Conclusion

The instructional development model described in this paper was deliberately constructed to eliminate the boxes and arrows commonly used to illustrate how development works. Many of my colleagues and training associates view this as a maturing of the field. Just as computer scientists have all but eliminated the flowchart from the programming process—a result caused by sophistication of ideas and operations—so instructional developers are establishing conceptual systems that cannot simply be reduced to several boxes with connecting lines and arrows. A well-organized development system would be too complex to diagram, and if it were diagrammed, no one could follow it.

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26
Promoting Adherence to a New Paradigm of Instructional Management

Robert A. Reiser
Center for Educational Development and Evaluation
Florida State University
Tallahassee, FL 32306

As an instructional designer in a university, I occasionally feel I am at the mercy of my fellow faculty members. I feel this way because it is difficult to ensure that my colleagues will properly implement the materials I develop.

I usually develop materials for a course in conjunction with the faculty member who is responsible for the operation of that course. When I am satisfied that the materials I have developed are effective, I give the materials to the faculty member so that he or she can implement the materials in the course. However, implementation does not always proceed as planned. Sometimes the way the materials are used bears little resemblance to the way they were designed to be used. And sometimes the materials are not used at all.

These implementation problems are examples of what may occur when the traditional paradigm of instructional management is adhered to. According to Heinich (1970, p. 146), this paradigm places the faculty member (that is, classroom teacher) in complete control over the instructional tactics used in the classroom. Thus, the classroom teacher decides what instructional materials will be used in the classroom and decides how those materials will be used.

The absurdity of the traditional paradigm has been noted by Heinich (1970, p. 144). He states that under the traditional paradigm, we get extremely capable people to design instructional materials and then we allow less capable people to decide what to do with those materials.

A new paradigm of instructional management has been described by Heinich (1970, pp. 146-149). According to this paradigm, all decisions regarding instructional tactics are made at the curriculum planning level of the instructional process. These decisions are made by teams whose members include instructional designers and classroom teachers. The decisions involve assigning some instructional responsibilities to instructional materials and other instructional responsibilities to classroom teachers. Once an instructional responsibility has been assigned to some instructional materials, the classroom teacher does not have the authority to override that decision. If the classroom teacher is unhappy with the decision, the teacher must express his or her displeasure to the team, who then decides what, if any, action to take. Thus, the classroom teacher is not the sole arbiter of what occurs in the classroom (or in any other environment in which instruction takes place).

Adherence to the new paradigm of instructional management might result in improved instructional effectiveness and efficiency. Many educators, however, cling to the traditional paradigm. According to Heinich (1970, pp. 138-139, 170-171), this indicates that classroom teachers assume authority over what occurs in the classroom, and instructional designers are reluctant to question that authority. Thus, the new paradigm is rarely adhered to. The remainder of this paper will show how instructional designers, particularly those in higher education, can employ to promote adherence to the new paradigm.

To promote adherence to the new paradigm, instructional designers must clearly define how the instructional materials they develop should be implemented. The activities that should, and should not, accompany the use of the materials must be clearly defined. On occasion, I have developed instructional materials without devoting sufficient attention to specifying how those materials should be implemented. When I have done so, I have found that the materials I developed have not been implemented properly. Furthermore, in these instances, I have inadvertently supported adherence to the traditional paradigm of instructional management by allowing classroom teachers to decide how instructional materials will be used.

Adherence to the traditional paradigm of instructional management is also supported when an instructional designer decides upon a solution before identifying a problem. Many instructional development projects begin with a classroom teacher asking an instructional designer to develop a specific product for the teacher's course. Frequently, the instructional designer will then develop the product (solution) the classroom teacher requested without examining whether that product is appropriate. In doing so, the instructional designer is supporting adherence to the traditional paradigm of instructional management.

To avoid this situation, instructional designers must begin examining real needs. When a classroom teacher asks an instructional designer to produce a solution (product), the instructional designer should respond by trying to help the classroom teacher to identify the problem. Once the problem is identified, the instructional designer and classroom teacher can work together in determining what instructional materials and activities, if any, can be used to solve the problem. Thus, the instructional designer becomes involved in curriculum planning.

Instructional designers must attempt to ensure that decisions made at the curriculum planning level are not ignored by classroom teachers at the classroom implementation level. In higher education, one way to ensure that decisions made at the curriculum planning level are not ignored is to obtain a written agreement from a faculty member or his or her department. Such agreements may specify that in consideration of the development efforts involved, a faculty member or department will agree to use a specific set of instructional materials in a prescribed fashion for some specified period of time. The agreement may also state that during the specified time period, the manner in which the materials are used may be changed, but only upon the consent of all the parties involved.

Some instructional designers may prefer to obtain an oral agreement rather than a written one. Whether an agreement is oral or written, it is a good idea...
to obtain the agreement from an academic department rather than from an individual faculty member. An agreement with an individual faculty member terminates when that faculty member leaves the university or stops teaching the course which was the subject of the agreement. An agreement with a department, however, is not subject to changes in personnel or changes in teaching assignments.

Heinich (1970, p. 171) has stated that instructional designers should attempt to enter the instructional process before faculty members have been assigned to teach a particular course. If an instructional designer can do so, then he or she becomes involved in designing a department’s course, rather than a faculty member’s course. If a course has not been claimed by a faculty member, it is much more likely that an instructional designer’s suggestions regarding course materials and procedures will be accepted. Thus, by working with departments and attempting to become involved with a course before a faculty member has been assigned to it, an instructional designer can avoid many design and implementation problems.

No matter when an instructional designer becomes involved with a course, it is likely that he or she will eventually work with a faculty member who is, or will be, responsible for the operation of the course. I believe it is very important for the instructional designer to get that faculty member fully involved in the instructional development process. I have found that the degree to which a faculty member is committed to some materials is directly related to the degree to which the faculty member was involved in the development of those materials. It is particularly important that during the development process, the faculty member becomes involved in determining how the materials will be used. If the faculty member helps make implementation decisions at the curriculum planning level, it is unlikely that he or she will attempt to ignore those decisions at the classroom implementation level.

While the instructional designer’s main efforts should take place at the curriculum planning level, I have found that the instructional designer must also be involved at the classroom implementation level, even after formative evaluation (including field testing) has been completed. During formative evaluation, the instructional designer is closely monitoring course procedures and outcomes. When this monitoring ceases, the manner in which materials are used may change, and student performance and/or attitude may be negatively affected. By regularly monitoring outcomes in a course, even if it is done only once a semester, the instructional designer will be able to note any changes in student performance and attitude. If a major change has occurred, the instructional designer can examine whether improper implementation of instructional materials has caused the change. If improper implementation is the problem, the designer can then take the necessary steps to ensure that the materials are used in a manner that will maximize their effectiveness.

I have saved what I consider to be the most important point for last. Heinich (1970, p. 147) has indicated that providing individualized instruction in learning centers is one of the best ways of ensuring that instructional materials are presented as they were designed to be presented. A learning center that is developed and operated by an instructional development organization can solve many of the problems faced by instructional designers. Currently, such a center, tentatively called the Learning Success Center, is being designed at Florida State University.

The Learning Success Center at Florida State is being designed to improve student learning in those courses that use the Center’s facilities. The Center will accomplish this goal by providing a setting in which students will study instructional materials designed or selected by teams of faculty members and instructional designers. Unlike the materials in many learning centers, the materials in the Learning Success Center will be employed as integral parts of a course, they will not be used as aids to classroom instruction.

It is planned that the Learning Success Center will be used in conjunction with another center that has already been developed at Florida State: the Assessment Resource Center (ARC). The facilities of the ARC are used to administer and score objectives-based tests to over three thousand Florida State stu-

dents each quarter. The tests in the courses that use the ARC have been designed by teams of instructional designers and faculty members at Florida State. All items on the tests are keyed to instructional objectives. Immediately after taking a test in the ARC, the student receives feedback from a computer indicating how well he or she performed on each of the objectives covered on the test. The student can review materials related to those objectives with which he or she had difficulty and is then given the opportunity to take another version of the test covering those objectives.

Before a portion of a course is placed in the ARC, all decisions regarding assessment are agreed upon by a team of instructional designers and faculty members. Similarly, before a portion of a course will be placed in the Learning Success Center, faculty members and instructional designers will decide all issues regarding instructional materials and activities in the course. These decisions will be binding unless the faculty members and instructional designers decide otherwise. Thus, by developing desired facilities, and offering the use of the facilities to those who agree to certain conditions, instructional designers at Florida State are able to accomplish two goals. First, they are able to become involved in decision-making at the curriculum planning level. And second, they are able to ensure that those decisions reached at the curriculum planning level are carried out at the classroom implementation level.

Earlier, I stated that as an instructional designer, I occasionally feel I am at the mercy of my fellow faculty members. I have felt this way less frequently since I have started to use the techniques described in this paper. If you are an instructional designer, I suggest you try some of these techniques. By doing so, you may solve some of your immediate problems and you may also promote adherence to a paradigm that will help prevent future difficulties.

Reference
Putting Together an Instructional Development Team

Edward E. Green
and
Gordon E. Mills
Department of Development Services
David O. McKay Institute of Education
Brigham Young University
Provo, UT 84602

Often in instructional development, we are faced with the decision to organize a production team based upon a team approach or an individual approach. With increasing demands for the services of instructional development there exists more often than not a need to organize a team of specialists together to help solve instructional problems. In their attempt to solve instructional problems, however, they create their own problems usually associated with the organization and proper functioning of a team. This paper will discuss five factors usually associated with the concept of project management which when considered and properly prepared for will facilitate the creation and operation of an effective production team. We will examine the necessity of (1) analyzing available internal and external resources, (2) defining roles of specialization and generalization, (3) establishing communication networks, (4) determining rules of team operation, and (5) evaluating reward structures within the team.

1. Analyze available internal and external resources. Internal resources are those which are available within the team. You most likely will have those who are specialists in evaluation, instructional research, facilities design, instructional design, and so on. External facilities might include specialized production centers such as a motion picture department, instructional T.V., facilities planning, equipment services, and so on. It will be necessary initially to list these resources and describe the contributions each can make with respect to solving instructional problems. Much of this information will also have impact upon the other factors which are described in this paper.

2. Define roles of production team members. Included within this phase is typically a description of particular tasks assigned to team personnel, their functions in relationship to each other, and procedures which will govern the use of facilities and personnel all controlled by the use of an integrative set of forms such that when completed will assist with the smooth operation of the team. The definition of each member's role should include their rights, responsibilities, internal and external powers, and their association with the formal and informal communications channels described in the next phase. For example, there typically exists a director of a development service, several project directors, and a variety of production specialists. You may want to delineate their job descriptions as follows:

(a) Director, Development Services. (1) Assists in the initiation of development projects in collaboration with his supervisor. He notifies his supervisor of any possible development projects and coordinates with that office in initial presentations with prospective clients. (2) Coordinates the assignment of project directors to specific development projects and is the final reviewer for all documents and products which are delivered to clients. (3) Reviews milestones for the completion of all projects by interviewing project directors periodically to determine the status of reports and/or products associated with each project. (4) Coordinates the project functions with prototype production. (5) Prepares a quarterly report on all development projects for submission to his superiors. (6) Coordinates a peer review process. (7) Mediates when conflicts occur with schedules, services, project director/client relations, and so on.

(b) Project Director. (1) Plans development functions (including evaluation) for projects under their supervision. (2) Submits required reports and production to Director of Development Services for peer review. (3) Follows through with all action items indicated in the project plan. (4) Maintains quality control over products and processes developed within each project under their direction. (5) Meets periodically with the director of Development Services for a project review. (6) Generates first and final drafts of all required project documents. (7) Act as peer reviewer upon request from the director of Development Services.

(c) Production Specialist. (1) Works with project directors in planning all prototype production for all development projects. (2) Coordinates the work efforts of freelancers, full-time personnel, graduate assistants, and undergraduate part-time employees. (3) Coordinates with typing pool. (4) Clears with the director of Development Services all personnel requests for freelancers, graduates assistants, and so on, as required for prototype production. (5) Coordinates with director of Development Services and the project director in charge of specific projects to insure completion date commitments to clients. (6) Coordinates with director of Development Services to notify him of any problems or production deadline slips as early as possible within the development process. (7) Coordinates required services from on-campus agencies such as photo graphics, audio, T.V., and the press. (8) Works with project directors in determining needs for message design.

Within the context of these job descriptions the functions and tasks to be accomplished by each will emerge.

3. Establish communication networks. Formal channels of communication are usually reflected within work flowcharts. For example, if we are considering the three positions outlined above, they may be described formally as shown in Figure 1. Formal channels and the interrelationships of each team member need to be clearly defined and established.

The development of informal networks requires positioning team members in work settings that allow them to work together more effectively. As you improve upon the informal channels you, as a coordinator of project teams, enhance the formal channels as well.
and, therefore, build into the system a more effective working unit. We must remember to continually consider questions of motivation and satisfaction within the tasks themselves which are required of team members as well as the working environment created by those tasks and by managers who are in control of particular environmental situations.

4. Determine a set of regulatory rules to govern the team. Rules and regulations concerning the proper functioning of a production team usually require a set of policies and procedures which describe the formal communication networks with respect to job descriptions, the instructional development model to be followed when possible, reporting procedures, and necessary regulatory forms which will assist in carrying out all of the functions mentioned in this paper. A policy and procedures manual could be developed to include the following components:

   a. A statement of team mission describing audiences to be served and the types of consultation and development services which are performed.

   b. Personnel job descriptions outlining the formal channels of communications and responsibilities.

   c. Project reporting procedures which might include (1) an initiation form, (2) a design document, and (3) a final report. Examples of these forms are included in Figures 2 and 3.

   d. Recordkeeping responsibilities such as the Budget and Timeline form are shown in Figure 4.

   e. Definition of project load for instructional developers. Here is a set of variables that affects content, subject matter, expert relations, and other environmental factors could be given numerical weighting to use in the assignment of projects to project directors and other team members.

5. Evaluating and maintaining the production team. Once all of these efforts have been completed, concern needs to be given to continuous questions of motivation, satisfaction, and maximizing the potentials of both human and physical resources. As an instructional developer attempts to integrate these apparent independent units into a properly functioning team, problems are often encountered. Some team members become discontent because they are not given the exact role they prefer. Some are not completely satisfied with their status and the distribution of rewards, while others might complain about being outside the mainstream of policymaking and channels of communications which do not favor them as such. Haiman (1957) describes this as a cycle of circumstances caused by the division of labor we have just described. These become symptoms, a team leader must watch for as he evaluates his production team. This is Haiman’s list:

   a. A division of labor leads to specialization.

   b. Some specialties are more important to a group than others and a higher value is therefore placed upon them.

   c. Rewards and prestige are granted in accordance with the value of the specialty and enhance any qualities of wealth and influence that are developed.

   d. Specialization also creates a need for coordination and the coordinator must be given power and authority, thus a hierarchy is created.

   e. Differences of rank erect barriers to communication and the more sharply defined these barriers become the greater is the interference with feelings of comradeship spirit.

The implication for the development team leader is to (1) allow the team members to function within their preferred roles, (2) review periodically with the team members the importance of their contribution, and (3) create a communication network which will allow

![Figure 1. Relationship of team members.](image-url)
PROJECT INITIATION

GENERAL COURSE OR ENVIRONMENTAL INFORMATION

College: ___________________ Department: ___________________

1. Proposed Project Title: ______________________________________

2. Person(s) who would be involved in developing the project and what will be their contributions.

3. What is the instructional need?

4. What evidence is there that this need exists?

5. Desired project initiation date: _________________________________

6. Project implementation date: _________________________________

7. Catalog description of the course (if applicable):

8. Usual teachers of this course (or who will use this product):

9. Schedule for offering course:

10. Anticipated enrollment:
    Fall____ Winter____ Spring____ Summer____
    Home Study (if applicable)____

11. Number of sections each semester:____

12. Average size of sections:____

13. Course prerequisites:

14. Courses that usually follow this course:

15. Titles of texts, workbooks, and lab manuals currently used:

16. Unique facilities required:

17. Describe the audience who will be using the materials.

COMPLETED PROJECT DESCRIPTION

18. What instructional materials and methods are expected?

19. What is the anticipated extent, length, etc. of each of the above mediums?

ADDITIONAL INFORMATION

20. Can materials developed for this project be used in other courses taught at this University?

21. Will the material developed be usable outside BYU (other schools, industry, military, etc.)?

22. Describe the extent to which present content is available or how it may be obtained and how easily.

PROPOSED BUDGET

McKay Institute Staff: _________________________________________

Released time required of faculty: ______________________________

Materials and Supplies: _______________________________________

Travel: ____________________________________________________

TOTAL ____________________________________________________

Figure 2. Sample Project Initiation form.
THE DESIGN DOCUMENT

Product Description

A description of potential products indicating quantities, scope, and anything unique for use as feedback, clarification, etc.

Materials Search Information

What has been done in other areas within the University, or any other school, publishing house, etc. in this content and design area? Project directors will meet with Information Science personnel within the Library and subject matter experts to make sure that resources such as TAPS, ERIC, Learning Directory, etc. have been accessed.

Facilities Analysis

A description of rooms, LRC capabilities, labs, both as they exist and as they can be modified to meet the needs of the proposed project. Any implementation concerns should be voiced in this section.

Content Plan

This includes scope, sequence, and level of difficulty concerns at least at the unit and lesson levels. Since content usually expands when we begin producing instruction, firm agreements need to be made at this point with the understanding that a future expansion from this outline means a required increase in appropriated funds.

System Analysis

A simulated “walk-through” of all materials, equipment, space, and people as they interact within the proposed “system” of instruction. Clarification should be given to:

- Learner roles and responsibilities
- Teaching roles and responsibilities
- Message design considerations
- Evaluation plans for the student, products, and the system as a whole. (This is also to be discussed separately in the next section.)

Evaluation Plan

1. Student Evaluation. Discuss how objectives will be tested, what types of questioning will be used, reporting procedures via Testing Services, etc.
2. Product Evaluation. Tell how the components of instruction such as lectures, syllabi, A/V presentations, etc. will be judged and evaluations reported.
3. System Evaluation. Explain formative and summative evaluation, the system for reporting such information, to whom it will be sent, and possible decisions which might be possible.

Prototype

A rough sketch of all components of one unit of instruction mainly to:

1. Provide an example of all of the 5 items mentioned above.
(Finished packaging estimates are not possible until prototype production has been revised after evaluation data has been reported.)

1 Proposed Budget

A budget for prototype production as well as firm report of past expenditures.

Author Agreements and Client Contract

Expectation of the department, the client, and anyone else participating in the project are agreed to in writing. Indications are clearly given which will make it possible for everyone involved to determine when the project has been completed and terms of the contracts have been satisfied.

Figure 3. Sample design document.
all team members to be properly informed concerning production matters. These three procedures will help alleviate some of Haiman's concerns.

Organizing according to the five major considerations given in this paper takes advantage of both the team approach and the individual approach to instructional development. The advantages from the team concept are that decisions become truly joint decisions between team members because a variety of sources for input are sought by decisionmakers. An advantage from the individual approach is that the project director becomes more responsible for producing documentation, outlining milestones, designing instruction budgets, and so on, yet, he is also given the responsibility to follow through and implement these plans. However, he is consulting other team members along the way and so is giving strength not only to these documents and plan, but also to feelings of team membership and importance by all team members. Working this way more alternatives can be generated, conflicts can be managed, synthesis as well as analysis can be emphasized, and decisions can be scrutinized and evaluated much more systematically and clearly.

Reference

INSTRUCTIONS FOR

Criteria for the Selection of JID Articles

Articles submitted for publication in JID are refereed by an Editorial Board using specified criteria. There are two sets of criteria. The first set applies uniformly to all types of articles.

General Criteria for All Manuscripts

A. Purpose and scope. Does the manuscript fall within the purpose and scope of JID?

B. Contribution. Does the manuscript make a new contribution to the field of instructional development by presenting a new point of view or presenting a new look at a traditional point of view?

C. Literature-based. Does the manuscript indicate that the author is aware of, and incorporates, what others have already reported in the literature about the topic being addressed and related topics?

D. Generalizability. Does the manuscript present theory, procedures, or results in the form of conclusions which can be generalized and used by other instructional developers:

1. Logical extension. Are the general conclusions logical extensions of the work reported?

2. Utility. Will the general conclusions be useful to other developers as guidelines for their work in other settings?

3. Clarity. Are the general conclusions stated in a clear enough manner for other developers to envision how they might apply the conclusions in other settings?

E. Readability. Is the writing style of the manuscript readable, clear, and understandable to the reader?

F. Conciseness. Does the manuscript merit the length it takes to say what it has to say?

Specific Criteria

The following set of criteria (Verifiable, Disciplined, and Conceptual Structure) will be applied to all manuscripts, but different questions will be used to judge manuscripts that fall into different categories. Manuscripts will be placed in one of three categories:

1. Theory/Procedure/Approach—dealing with the why, the what, or the how of instructional development.

2. Case Studies—dealing with a specific application of the what or the how of instructional development in a specific setting.

3. Inquiry—data-based studies dealing with evaluation and/or validation of instructional development techniques or products.

The specific criteria, by category, are as follows:

1. Theory/Procedure/Approach

G. Verifiable. Is the theory, procedure, or approach presented in sufficient detail so that an informed reader could test the theory or replicate and apply the procedure and approach?

H. Disciplined. Does the description of the theory, procedure, approach, contain: (a) the assumptions on which it is based; (b) terms that are clearly defined with examples; (c) procedures that are clearly and completely explained so they can be followed by an informed reader?

I. Conceptual Structure. Does the description of the theory, procedure, or approach indicate how it is different from, or an extension/elaboration of, current theory, procedure, approach, and are these theories, procedures, approaches identified, described, and/or referenced?

2. Case Study

G. Verifiable. Is the project described with sufficient detail so that an informed reader could replicate the technique or products used?

H. Disciplined. Does the description of the project include the: audience; instructional setting; subject matter content; instructional development approach used; delivery system; instructional management and implementation procedures; validation procedures and results; limitations and constraints of the specific case?

I. Conceptual Structure. Is the project an example of a particular procedure or approach? If so, is the procedure or approach clearly described or referenced, and is the way the case is related to the procedure or approach clearly specified?

3. Inquiry

G. Verifiable. Are the instruments, activities, materials, and steps used in the inquiry described with sufficient detail so that an informed reader can understand, examine, and to some extent replicate the plan used in the inquiry?

H. Disciplined. Does the description of the inquiry include its: assumptions and boundaries; hypotheses; methodology; results; conclusions? Are these elements logically consistent?

I. Conceptual Structure. Does the inquiry go beyond the day-to-day tasks of instructional development to address a fundamental question related to instructional development? Is the theory, procedure, or approach being questioned described or referenced? Is the way in which the inquiry is related to the theory, procedure, approach clearly specified?
Preparation and Submission of Manuscripts

Manuscripts which do not conform to these guidelines will be returned to the author for revision.

Typing of Manuscript
- Double-space everything—even footnotes, references, and long quotations within text.
- Use plain white paper, standard letter size (8½ × 11 inches). Avoid easily erasable papers, slick papers that some copiers use, rag bond, onion-skin.
- Type a 6-inch line—72 characters elite, 60 characters pica. Type 25 lines to a page.
- Use plain type—no italics or script. To indicate italics, underline. Do not use italics for emphasis too often; if you do, the italics will lose their emphasis. Avoid unusual symbols and Greek letters, but if you must use them, type them if you can; if hand-written, identify the letters or symbols by writing out the name of the symbol.
  For example: \( \Delta \) (Greek letter delta).

Style
- Use capital and lower case letters for the title and author bylines.
- Spell out the words Figure and Table. Use Arabic numerals to number figures and tables. Example: Table 1, Table 2, Figure 1, Figure 2.
- Spell out abbreviations and acronyms the first time they are used. This applies to commonly used abbreviations as well as to others. Exception: U.S. when used as an adjective (The U.S. economy, U.S. Office of Education). (USOE). JID may be used without spelling it out. Spell out the names of associations when first used. Example: American Library Association (ALA). AECT should be spelled out but need not be followed by the acronym; afterwards, the acronym may be used alone. Spell out the names of states in the text but use the two-letter state abbreviation with the zip code in addresses.
- Spell correctly. Follow American usage.

Writing
- Be clear. Say what you mean. Don’t make the reader guess, even if it’s easy. For example, take this shopworn example of poor writing: For Sale: Piano, by a woman with carved legs. Everyone knows it’s the piano, not the woman, that has carved legs. That doesn’t excuse sloppy writing.
- Use nonexist language.
- Authors are encouraged to use the terminology in Educational Technology: Definition and Glossary of Terms published by AECT.

Parts of the Manuscript (in order)
- Cover page. Include the title of the manuscript and the full names of all authors. Also provide the title or position, organization or institution, complete mailing address including zip code, home and office telephone numbers, for each author. Indicate which author should receive editorial correspondence.
- Abstract. Summarize the article in not more than 15 typewritten lines.
- Text. Identify each page with author name(s) and page number in upper right.
- References. List only those works cited in text. Follow the style described in the Publication Manual of the American Psychological Association, second edition. Be sure reference list is complete, accurate, and consistent with citations in text.
- Footnotes. Do not use footnotes unless they are unavoidable. Text footnotes should be typed together on a separate page, not on the page where the footnote number appears. Be sure footnotes are cited in text, that the sequence is correct, and that the numbers in text correspond to the footnote numbers.
- Tables. Construct tables carefully. (Useful advice concerning the presentation of data in both tables and figures may be found in AV Communication Review, Vol. 25, No. 4, Winter 1977, “How Numbers Are Shown,” by Michael MacDonald-Foss.) Number all tables and provide succinct, descriptive titles. Make sure tables are referenced in text.
- Figures. Type figure captions and titles together on a separate sheet, not as part of the figure. Number all figures and provide titles for the figure. Source, credit lines, explanatory material may be added as a caption for the figure. Figures must be provided in camera-ready condition. Use 9-point helvetica, univer, or similar typeface. If figure is to be reduced, use 10-point bold or larger. Typewritten material is seldom reproducible. Photographs must be black and white, 5 × 7 or 8 × 10 inches.

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- Submit 4 copies of manuscripts for consideration by the Editorial Board. Each copy must be complete, clear, and readable. Provide photocopies of camera-ready art and photographs, if any. Original art and photographs should be identified with the author’s name, address, and whether or not art should be returned. Do not write on the back of photographs. Tape the information to the art or photograph.
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