Instructional Systems Development in the Next Decade

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As the 1970's come to a close, a reflective mood emerges and causes periods of summative review and of future predictions. This reflectiveness was perhaps the source of two recent articles in the *Journal of Instructional Development*, Fall, 1978 entitled "The Future of Instructional Development—Through the Looking Glass Darkly" by Kent Gustafson and "Instructional Development: Deliverance" by Kenneth Silber. The authors took diametrically opposed positions of the future of instructional development. Their papers originally were presented for the 1978 Association for Educational Communications and Technology Convention in Kansas City. The authors were asked to take opposing points of view concerning the future of instructional development: Silber positive and Gustafson negative. The articles were admittedly one-sided, and it should be noted that the authors could have switched sides in the debate. Their purpose was to generate professional dialogue, and thus this article and their success.

The Gustafson-Silber Debate

The major thrust of the Gustafson article was that as instructional developers we have not attuned ourselves to the forces of the outside world, e.g., the economy, energy, mood of the public. The point may be a valid one, yet, as with all reflective opinions, this perspective of developers being overly concerned with the inner world of academia may be self-fulfilling rather than descriptive. The underlying premise of this article is that the problems with instructional development today are due to the lack of input from the outside world. This "them against us" metaphor of "outside versus inside world" is often used to create a platform to launch platitudes of doom.

Refuting the conditions of the "outside world" as they impact upon instructional development is not the intent of this article. In fact, most of the issues raised by the Gustafson article can be defused with the conscientious application of the systematized approach to instruction. It can be shown that systematic instruction is more cost-effective than traditional instruction and is therefore recommended during times of diminishing resources.

The Silber article differs from the Gustafson article in being more positive and up-beat in its prediction of the future of Instructional Development. Silber asks the question, "Why is there skepticism about whether or not ID can deliver?" The answer to this question, according to Silber, is that "We . . . promised to deliver too much too soon—and did not deliver." This answer may or may not be true, depending upon what was to be delivered. The article then goes on to list the major components of the systematic process of instruction and identifies persons who have contributed to those component processes, e.g., Management of ID, Diamond; Instructional Strategies, Gagné and Briggs; Task/Content Analysis, Merrill, etc. In the conclusion to his article, Silber lists some of the problems associated with the future of ID: (a) keeping pace with new knowledge in the field; (b) discovering additional skills related to how individuals process information; (c) expanding the target audience from higher education to business, industry, medical education, and special education; and (d) finding a professional home for instructional developers.

The problems, according to Silber, unfortunately do not address the question of "Why did we promise too much too soon?" The answer to that question cannot be revealed by examining the outside world, according to Gustafson; or keeping pace with the current body of knowledge or expanding the target audience or finding a professional home, according to Silber. The answer to that question can be found by the introspective examination of what we do and persuade others to do in solving instructional problems.

Before continuing it should be said that the Gustafson and Silber debate raises important and valid issues that must be addressed by all instructional developers at one time or another. Those issues in part are: (a) developing an academic environment that is a subset of a larger environment which influences the instructional development domain, (b) finding a professional platform designed for keeping pace with new knowledge, and (c) acquiring additional skills that could strengthen all participants. However, if the instructional systems approach is to counteract the skepticism about the future alluded to by Gustafson and Silber, we in academic settings must examine our procedures, our techniques, and our limitations. In this way, we can discover our professional direction and determine if it is in fact congruent with our abilities and goals. The remainder of this paper will examine one of the cornerstones of instructional systems design: models of design and development as they translate and dictate the instructional processes. Let's begin with a brief examination of the instructional systems development approach, its components and strengths.

ISD: Improved Efficiency and Effectiveness in Teaching

What is the best way to organize work so that it meets all learning objectives and finishes in the shortest period of time? In the areas of education and training, the last quarter of a century has witnessed the conceptualization and, to some degree, the implementation of the systematic process of developing instructional materials on a large

scale basis. This large scale compartmentalization of differentiated instructional functions, each of which operationalizes measurable output variables, has been called the instructional systems development (ISD) approach to training. It has also been referred to as: systems approach to training (SAT), the design of instructional systems (DIS), and several more. The differentiated instructional functions, i.e., components like task/content analysis or formative evaluation, are synergistic in that the interactive relationship of the components strengthens the entire development process. In addition, the ISD approach is cybernetic in that the cyclic effect of evaluative feedback continually modifies the input variables.

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Theoretically, the ISD approach improves effectiveness and efficiency each time evaluative feedback re-enters the system. It might appear that there are natural algorithms, or step-by-step rules for these models. That, however, is not the case. Apparently, logical ways of constructing ISD models cannot be counted on to perform equally well in different training situations. For example, many systems models had their genesis in computer or hardware technology, which may inadvertently have lessened the social aspect of training, i.e., the incidental attitudinal and social outcomes which always accompany instruction for the instructor as well as the student. Secondly, most ISD models were originated to facilitate the design and production of instructional materials for training courses. Therefore, many systems models only pay "lip service" to the larger system issues e.g., diffusion, management, training environment, selection of participants and implementation.

Generic Components of ISD

There are a variety of ISD models currently in use in military, industrial, and academic settings which vary widely in terms of the component procedures. The designer's level of expertise, desire to proceduralize development steps, and cost-effectiveness are the main reasons for such diversification. Most of these models can be reduced to five functional phases. Unfortunately, the operational definition of these components differs in content and procedures across models. A circumscribed definition of each of the five phases will be stated to establish common referent.

Needs Analysis. This activity is usually done within the organization and consists of (a) mission analysis or job analysis, i.e., assigning tasks to job descriptions and (b) training analysis, i.e., determining manpower, facilities and equipment requirements to maintain the training setting. It usually includes administrative and policy constraints.

Design. The design phase of ISD consists of five major activities: media selection, course organization, lesson specification, evaluative feedback, sequencing, and implementation strategies. Each of these phases requires expert decisions necessitating a varied set of skills and experience.

Development. The developmental phase of ISD consists of three major activities: operationalizing design strategies, formative tryout, and production.

Implementation. Implementation of a newly developed or revised instructional program has two requirements: (a) providing training for instructors and instructional managers and (b) conducting the actual instruction on students.

Evaluation. The evaluation phase is a broadbased, continuing activity which fine tunes each of the four previous phases. It is an on-going, cyclic activity which measures and evaluates the output of each ISD activity.

The Phases Rarely Help the Designer Make Decisions

The five generic phases of ISD have become buzz words of instructional technology and often have idiosyncratic interpretations that may be dysfunctional to other designers. The phases are components of material development flowcharts that act as procedural guideposts, but rarely reach the point of specificity whereby they help the designer make decisions for student prescriptions. Student-perscriptive decisions are those in which the designer combines creativity, intuition, and past experience to juxtapose the principles of learning (arousal theory, reinforcement theory) to levels of learning (cognitive, affective, psychomotor) for a specific target population (age, IQ, demographic background) within a defined environmental training setting (large class, simulation, field conditions). The greater the creativity of the course designer in generating training strategies the more likely the success of the resulting course. ISD technology can be used to examine critically those creative ideas but rarely to generate them.

There are other limitations of ISD which should be exposed before practitioners move into the 1980's. These limitations, while important, do not negate the inherent strengths and value of ISD in the design and development of competency-based training, so long as its promise is not exaggerated. The staff resources, costs, political implementation problems, and required designer and instructor training are but a few of the limitations which should be known before an education department adopts an ISD approach. The recent phenomenon of schools, industry, and the military adopting the ISD approach makes possible a critical review of effectiveness of alternative approaches. There is little research evaluating alternative ISD approaches to student learning. ISD may not be the only answer to training needs. Other areas yet to be included in the ISD sphere of influence are: human development, human behavioral engineering, and student selection based upon aptitude treatment interaction. While recognizing the inherent strengths of ISD and its continued expansion into other human spheres of influence, future training planners will benefit from examining some of the apparent limitations of the ISD system to minimize those problems in the 1980's.

Limitations of ISD

The thousands of manhours expended in the application of ISD have resulted in a reservoir of experiential wisdom which should be delineated. The listing and subsequent discussion of limitations should attune future developers to potential problems and save the organization time and resources. The limitations mentioned thus far in this paper now will be restated.

First, the ISD model was intended for training material development, thus ignoring the social variables such as attitudes, values, mores, and the cultural milieu which have an effect on training outcomes.

Second, most systems are situational to the training. Specifically, the management policies, staffing requirements, and diffusion strategies are three functions controlled by the organization that should be (but rarely are) represented in the overall training design.

Third, the front-end needs analysis, which typically validates problems requiring instruction, often ignores other solution strategies. These problems may be administratively solved through policy changes or they may be solved through bureaucratic changes in organizational structure or they may be solved through training and instruction. Usually, the first is less expensive than, for example, staffing a training department. The needs analysis completed within the organization rarely examines the larger societal problems that influence the organization. A greater interface between the client group and the educational department early in the generation of educational curriculum or objectives will save countless hours of development time and student time. Simultaneously, the credibility of the instruction will improve.

Fourth, another organizationally related limitation is with the evaluation of the training. The typical ISD evaluation is conducted on the instructional materials or a course or other single entity and rarely are these courses or materials grouped together for evaluation. For example, in the military setting the evaluation may take place on a task, e.g., calibration of a tank turret system. The subset elements of training are usually not combined to systematically evaluate the overall effectiveness of the total organizational mission. This problem and the needs analysis problems (stated above) are similar to one another in that the ISD model rarely forces training designers to look outside the training system for alternative solutions to supra-organizational needs.

The fifth limitation relates to the procedure of task analysis. This component has tremendous impact on development and training time because it is here that instructional value is assigned to content (facts, rules, and procedures). The task analysis breaks down the job into trainable components from which designers derive instructional strategies. What has been the typical case is that this analysis is being done from an "armchair" and not the field. Often what appears logical from an office point of view becomes unrealistic from the man-on-the-job point of view. This lack of realism for the job requirements is misdirecting training energies and is costly in terms of resources and program credibility. The typical task analysis involves structuring the procedural steps of the job, beginning with the hierarchical relationships and then preparing a format for sequencing and grouping conceptual ideas of the tasks into training segments. If, on the other hand, the ISD designer went to the subject matter expert and analyzed him on the job with interspersed interviewed questions for clarification, the designer would learn which elements of the task were more and/or less critical to the overall success of the job. The armchair approach does not know where to assign greater instructional time to the more critical elements of the task. Consequently, all task elements are treated equally, when in fact, the person in the field requires training that is matched to the criticality of certain subset functions in the job. For example, to administratively state that there is a 60 minute time limit per segment of instruction ignores the concept that some job elements require 20 minutes while others require hours. Through observation designers learn emphasis; not all task elements demand the same training effort.

There is a series of other ISD related limitations that can influence the success of training departments. The sixth limitation addresses the practice of overgeneralizing the design and development phases of an ISD model. The major thrust of the proceduralized ISD movement has been to reduce the reliance on scarce, expensive instructional technologists by developing course design manuals useable by personnel minimally grounded in instructional technology. The development of these manuals and algorithms which seek to model the decisionmaking processes assumes there are theories of learning and instruction which are refined well enough to permit formulation of course design rules. In addition, the assumption is that instructional technologists agree on such rules. Until those rules are discovered and validated each successful application of ISD will require an interdisciplinary team of subject matter experts and a competent instructional technologist. Directors of training departments must realize that while ISD methodologies are powerful, they only succeed as long as the instructional technologist adapts them to the training environment.

Limitation number seven relates to the issues just raised, i.e., adapting the ISD methods rather than adopting them. The variability found in training environments i.e., student competencies, content, and time, are frequently unique enough to require the instructional designer to modify the ISD approach. The adapting process requires a great deal of creativity. At most, ISD can be a checklist and guide for helping ensure that course design errors are detected and excluded before course implementation. The greater the creativity of the designer in generating training ideas, the more likely the resulting course will be successful. ISD can be used to examine critically those ideas, but rarely to generate them. The background experience of the designer is of great influence in choosing adaptive strategies. In addition to experience, creativity can be enhanced if the managers of training departments encourage diversity and rule-questioning behaviors in their designers. Adapting an ISD manual should not be discouraged until the results (i.e., student performance data)

Limitations of ISD

1. Social variables are not taken into account.
2. Most systems are situational to the training.
3. Other solution strategies are often ignored.
4. Courses and materials are evaluated as single entities rather than as interacting components of a larger whole.
5. Task analysis lacks realism.
6. The design and development phases of an ISD model are often overgeneralized.
7. ISD methods are often blindly adopted rather than creatively adapted.
8. There is too much reliance upon ISD developmental manuals.

are collected and analyzed. Professional competence grows with each adaptive method designed, i.e., creativity is encouraged as a person begins to understand that the external factors are controllable. Managers must set the norms for innovation in the training department. Student performance is the dependent variable of success, not following the lockstep procedures of an ISD model. Being trained in the psychological constructs of human learning and the successful alternatives available in meeting the training needs will encourage the designer to exert a creative approach. Adaptation should be the rule rather than the exception in the use of ISD models. Unfortunately, there are no rules for modifying the components typically found in these models. For this reason, it might be postulated that the processes used in adapting a generalizable ISD model to meet specific needs of varying training requirements and environments is an art rather than a science. This art may be learned best through a successful and monitored apprenticeship program, where the new designer learns to modify, synthesize, and aggregate real-world demands into a novel and very specific ISD model. If you will, a new model is generated to fit each new training environment. The interlocking of ISD designer training in theory and instructional technology to the changing demands of the real world will ensure available supplies of innovative competent designers in the 1980's. The last section of this paper will address itself to a hypothesized interlocking process.

The over-reliance on ISD developmental manuals is the eighth issue which might limit the future of ISD activities. Because the techniques and methodologies for training are rapidly changing, any dependence on an ISD manual diminishes the adaptive powers of the designer. The variable most related to dependency is experience. Therefore, to counteract this dependency and possible competency obsolescence, the managers of training departments must develop a reliable set of professional instructional designers who can match their real-world training needs to their continued professional development. The concept of interlocking emerges once again, and in this case the mechanism interlocking the real-world training needs to the latest validated technology is the professional designer in the field. In this instance, the personal needs of the designer match organizational needs in that, the training department has a cadre of professional instructional technologists who have in their repetoire all the latest psychological and technological skills necessary to meet the demands of a fast-changing world.

In addition, if the single model-manual is advocated there is the possibility that the designer will become indoctrinated to one manual's approach to design. There is no empirical evidence that there is one superior way to teach a skill or that one ISD model-manual is better than any other, so it becomes risky to adopt one manual over all others. The managers of training departments should base successful training development on student outcomes not on the procedures used by the designers.

During the last 20 years, the systems approach to instructional design has become the pre-eminant tool of instructional technology. As with any new tool, there are problems associated with the implementation and integration into the on-going training system. The eight limitations discussed thus far are meant to be refinements in our use of these models and perhaps a note of caution before a *zeitgeist* emerges that elevates an ISD model-manual over the creative good sense of a trained psychologist. One purpose of this paper is to suggest more realism in our ISD expectations.

Implications of Limitations for Instructional Development.

Instructional developers are often unable to profit from the efforts of their colleagues because it is difficult for them to describe their ID process unambiguously (Boutwell, 1978). Most often there is a systems model used that identifies the major guideposts signaling the sequence of common components found in their instruction. For persons not trained in human learning or the psychological constructs upon which instructional technology rests, the manuals and models were a short-cut to systematically designing instruction. The problems began to emerge as the variability of the training environment changed the nitch that systematic instruction first filled. That environment began to change—that is the social values and costs changed—but the ID process failed to adjust, because there was little variability in the manuals. When you learn only one method and the problem situation changes, the methods must adapt or they become obsolete.

Adaptation: The Key to the Future

This author believes that the reason systematic instructional development promised too much too soon rests in the fact that the methods with which we began have not adapted themselves quickly enough to fit the new environmental factors. Twenty years ago, systematic instruction demonstrated its strengths: synergism and cybernetics in compartmentalizing a very complicated interactive process, i.e., the operationally defined differentiated functions that controlled learning. The need filled then is even greater today. The systems approach has been accepted as one of the most efficient and cost-effective of training methodologies. The trend is clear that companies in (a) manufacturing, e.g., oil and aerospace; (b) transportation, e.g., auto and airlines and (c) service e.g., telephone companies and schools, will soon be competing for competent instructional technologists. The potential need for these professionals will continue to exceed the expected supply in the 1980's. If the trend continues, certain industries may have to resort to raising salaries, offering bonuses, and hunting a field to attract needed technologists. Other solutions may be hiring less qualified people and relying on using a single manual.

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If the promise of ISD is to be fulfilled we must return and examine our original goal. Silber stated the goal well in his article,

". . . . 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."

If the goal is still acceptable, we must train instructional developers and de-

signers in theory-based learning leading to adaptable instructional practices. This way, they will be able to adapt the rules we teach them today to meet the environmental situations of tomorrow. We have over-specialized the process to the point that professional adaptation has almost stopped. Competing algorithms, differential instruction strategies, and efficiency of one model (manual) over another are issues not being tested. Generating rules that govern which instructional strategy to use in competing environmental settings has not been tested. There are many other instructional design and developmental issues that need scientific inquiry and that may facilitate professional adaptation. As long as we continue to draw new models depicting sequential guideposts, and ignore asking and answering "principles of design" questions, we may see a time when the systematic design of instruction no longer meets an instructional need.

Reference

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