Instructional Systems Design: Five Views of the Field

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Abstract. Despite high enrollments in graduate programs, flourishing relationships with business and industry, and a general feeling that the field has much to offer, instructional systems design seems to confuse the public. Some think of it as focused on technology and/or the production of materials; others think it mechanical and antihumanistic. Still others claim the field is stuck in a behavioral paradigm. Perceptions like these have been voiced for years. Where do they come from? Are they true? This paper presents five ways the field is viewed and suggests how instructional systems design professionals can avoid ambiguity in the future.

Introduction

Ambiguity seems to shroud the field of instructional systems design (ISD). Consider these facts: The number of academic programs in ISD in the United States has steadily grown to more than 200 (Miller, 1985). Graduates of these programs are in high demand in the job market (Morgan, 1986). Linkages with business and industry are strong and expanding (Carrier, 1986). Technology provides a steady stream of exciting tools for communication and instruction and ISD professionals are recognized as skilled in knowing how and when to use them.

Despite these indications of vitality and growth, an undertone of criticism depicts ISD as:

- concerned primarily with the use of hardware,
- concerned primarily with the production of materials,
- not really a field, but a simple step-by-step method that almost anybody can teach and *anybody* can learn in a short period of time,
- blind to any solutions other than training,
- a rigid, mechanistic, linear, and/or antihumanistic approach to educational planning,
- a synonym for behaviorism.

Most ISD professionals have heard these statements at some time in their careers. The question is, can they be dismissed as reflecting only an individual speaker's bias, or do they in any way accurately reflect the field as a whole?

Academic fields can be stereotyped by people with a limited knowledge base. ISD, a blend of psychology, education, communications, management, systems theory, and social science, may be more open than most fields to "authoritative" comments from outsiders who, seeing one part of the picture, think they see it all. Still, it may be advantageous to examine the source of the criticism to be certain the profession itself does not add fuel to the fire.

Towards that end, five views of instructional systems design are presented in this paper. Each is held by some segment of the population as a true representation of the field; each of the previously mentioned criticisms can be traced to one or more of these views. By classifying what should and should not be considered an accurate representation of the field, the paper ultimately affirms what ISD stands for in theory and practice.

The Media View

People with the media view of instructional systems design see the field primarily as a process of media selection (Figure 1). They consider ISD professionals audiovisual specialists who know about the characteristics and effects of different kinds of media (as well as how to dry mount and laminate). ISD professionals are expected to be the first and loudest proponents of whatever new technology comes along and are valued for their technological expertise. Those holding this view are baffled by a designer who knows or cares little about the technical aspects of equipment operation; such a thing seems impossible given this perception of the field. The media view is particularly prevalent in higher education because ISD evolved from audiovisual education in many colleges and universities.

Comments. Of course, designers *should* be knowledgeable of all potentially valuable technologies. However, the basic premise of this view—that a dichotomy exists between the use of media/technology and the teaching/learning process—is a perennial plague on the field. Although Gerlach and Ely (1980), among others, have made a strong case against the media view, it lingers.

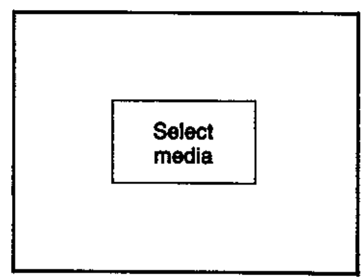

Figure 1. Media view of instructional systems design.

The Embryonic Systems View

The embryonic systems view (Figure 2) is similar to the media view, but emphasizes media production. Storyboarding, set design, graphic layout, photography, videotaping, editing, screen design, programming, and so on are assumed to be of paramount importance. Instructional planning is more a function of creative and artistic product development than of any systematic decision making.

This view is common where materials are produced on demand for clients in

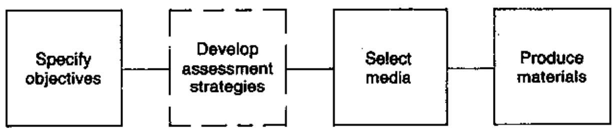

Figure 2. Embryonic systems view of instructional systems design.

higher education, government agencies, or the private sector. Consultation between clients and designers is largely the transmission of client-generated objectives for the development of a treatment in the chosen medium (also very likely predetermined by the client). According to this view, the development of assessment strategies to document learning outcomes is rare, but when undertaken is usually the task of the client. In fact, there is only one activity where the client must depend on the expertise of the design staff: production.

Comments. It is inexcusable for designers to use or produce low quality materials (unreadable transparencies, shabbily edited videotapes, etc.). Learninq theory as well as aesthetics dictate well-crafted and attractive materials. On the other hand, professionals in the field must guard against putting disproportionate emphasis on production standards if they represent themselves as instructional systems designers. Suppose, for example, an instructor contracts with a commercial television production studio for the creation of a simple videotape of a laboratory procedure and is told that, from planning to scripting to postproduction, the process will take six months. An emphasis on broadcast quality perfection might be expected from these professionals. If, however, the instructor contracts with the ISD center in his own institution, is given the same timeline, and finds the suggested treatment more "artistic" than he feels necessary, several things may happen: (a) He may decide the project is not worth the time commitment, or (b) He may eventually invest in portable videotaping equipment and create his own materials in the future. In any event, whether or not he feels a six month timeline excessive for a simple project, his view of ISD will resemble Figure 2.

The Narrow Systems View

This view (Figure 3) begins to look more like a real systems approach. Additional steps that call for refinement and sequencing of the subject matter prior to production seem to legitimize the process although the steps of needs assessment and formative evaluation are noticeably absent. It is no secret that real-world design work is sometimes a reactive approach to immediate or "trendy" problems rather than a result of systematic analysis of organizational needs and priorities (Bernhard & DiPaolo, 1982). Likewise, formative evaluation may be shortchanged or ignored because of lack of time or resources (Dick, 1981) or because it is an unfamiliar or undervalued process.

The narrow systems view is common among those who consider instructional systems design a simple method that can be quickly taught "cookbook" style. It is the "in-two-weeks-you-too-can-be-an-instructional-designer" view so prevelant in the Human Resource Development (HRD) seminar circuit. Writing behavioral objectives and test items and conducting task analyses are seen as the primary hurdles to overcome.

Comments. Academics and practitioners should argue strenuously against any representation of ISD that excludes needs assessment and formative evaluation. There are two reasons why students, newly employed designers, clients, and observers of the field must see these processes as essential parts of the whole and not add-ons. First, as Dick (1981) has stated, formative evaluation "has anchored the instructional design process in an empirical tradition" (p. 31). The same could be said for truly data-based needs assessment that establishes the critiera by which formative evaluation measures the success of a project. These processes, provide accountability for an often difficult, time consuming, expensive process that may affect many individuals.

Second, a view of ISD without these processes triggers the criticism that the field has "training blinders" since it implies that all needs/goals are instructional ones. A well-designed needs assessment first identifies the true needs of an organization and then determines which needs require the development of training and which require nontraining alternatives. The accuracy of these data will then be determined during formative evaluation. Even if time and resources are limited, the questions raised by needs assessment and formative

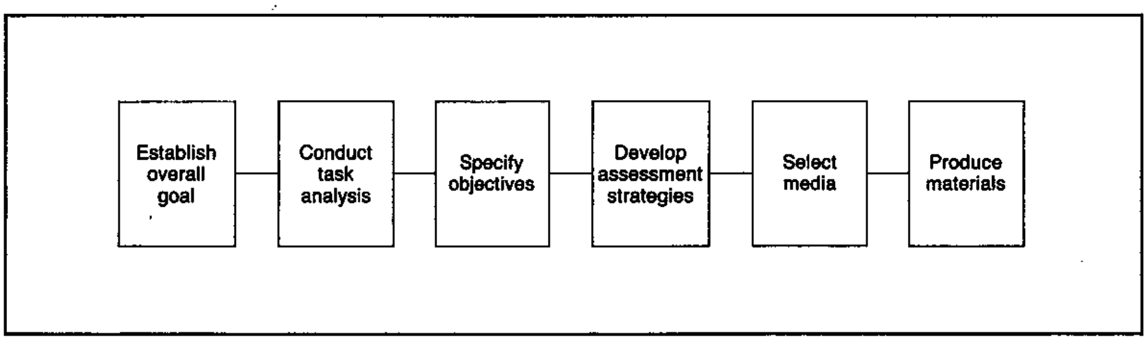

Figure 3. Narrow systems view of instructional systems design.

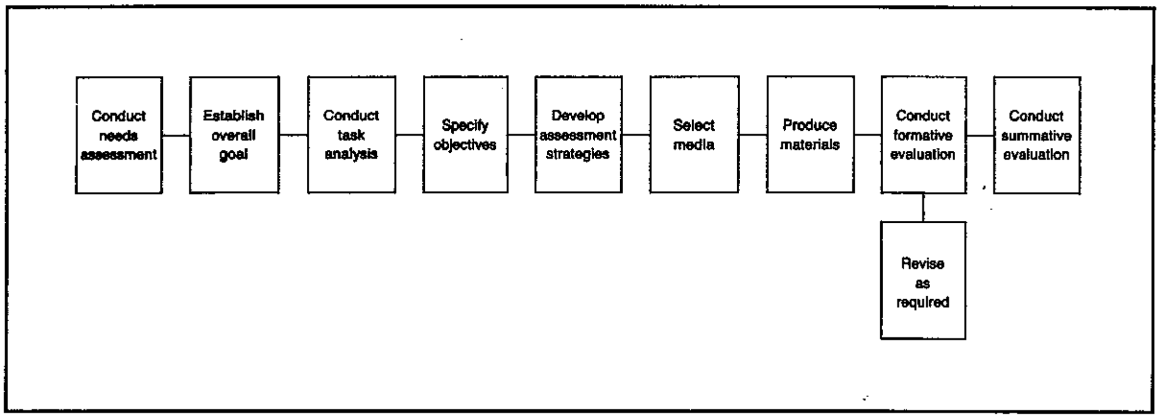

Figure 4. Standard systems view of instructional systems design.

evaluation must be addressed in any ISD project.

The Standard Systems View

The standard systems view (Figure 4) is named for its resemblance to what is widely considered a fair representation of instructional systems design. The major processes usually associated with ISD are included. Needs assessment is at the head, formative evaluation brings up the rear. Summative evaluation appears as a means of producing empirical product evaluation/marketing data. Figure 4 is a clear schematic of a complex, multi-step process that would serve well as a working design model. Note the distinction, however, between a *model*, which serves as a type of shorthand for designers familiar with its theoretical underpinnings, and a perception or view of the field. What conclusions would someone draw from Figure 4 assuming it to be representative of the totality of ISD?

First, consider merely the appearance of the graphic. It *is* linear. It looks rigid and mechanistic because of the step-by-step arrangement and the flowchart convention. As Chan (1984) points out, the lockstep sequence certainly does not appear "warm, humanistic, and artistic." He goes on to say that the jargon and maze of boxes and arrows associated with ISD lead many to believe that the field has "missed the mark, by failing to attend to global, holistic, and humanistic goals of education" (p. 8).

Figure 4 can also engender the belief that instructional systems design is a strictly behavioral approach to learning and instruction. The input-output structure and the emphasis on task analysis, objectives, and assessment of learning outcomes conjures up visions of machine-gradable (translation: low-level) training or, as Silberman (1970) puts it "the almost irresistible temptation to go after the things that can be measured" (p. 198).

Comments. Next to hardware, flowcharts like Figure 4 are the most visible accouterments of the field. Designers may use models for organizational and communication devices, but others, unaware of the theoretical/research context from which they are derived and upon which they are dependent for enlightened and insightful implementation, often take them as graphic representations of the entire field. Hence, it is not uncommon to find that those who criticize ISD for being mechanical, antihumanistic, and/or behavioristic have a standard systems view of the field in mind.

Academics and practitioners must counter this view whenever possible by educating clients, students, and others about what is required to successfully implement the steps shown on Figure 4. For example, it must be consistently stressed that the best needs assessment, task analysis, test items, and media selection in the world may be meaningless unless a designer simultaneously attends to matters of diffusion. Likewise, ISD professionals must be aggressive about linking the practice of the steps on Figure 4 with relevant (and current) learning theory and research. Failure to make these connections consistently feeds directly into many criticisms of the field.

The Instructional Systems Design View

Figure 5 shows instructional systems design to be a synthesis of theory and research related to (a) how humans perceive and give meaning to the stimuli in their environments, (b) the nature of information and how it is composed and transmitted, (c) the concept of systems and the interrelationships among factors promoting or detering efficient and effective accomplishment of the desired outcomes (Torkelson, 1977), and (d) the consulting and managerial skills necessary to meld points *a* through *c* into a coherent whole. The well known systems model functions as a series of gates that allow information to flow through at appropriate times. The gates facilitate systematic thinking in the midst of an often staggering number of variables designers attempt to control.

A single designer is usually not expected to have all of the knowledge and skills shown on Figure 5, although the smaller the design team, the more skills each person must have. However, whenever instruction is being designed, all five of the major categories (shown in capital letters on Figure 5) are called into play. For example, when it is time to write instructional sequences and design page or graphic layout, all designers—with or without a knowledge of learning theory and message design (Fleming & Levie, 1978)—will make decisions on these issues. Designers lacking familiarity with relevant research and theory substitute instincts and a good eye when making these decisions. Ideally, theory, research, instincts, *and* a good eye all are at a designer's disposal.

Similarly, a designer unfamiliar with

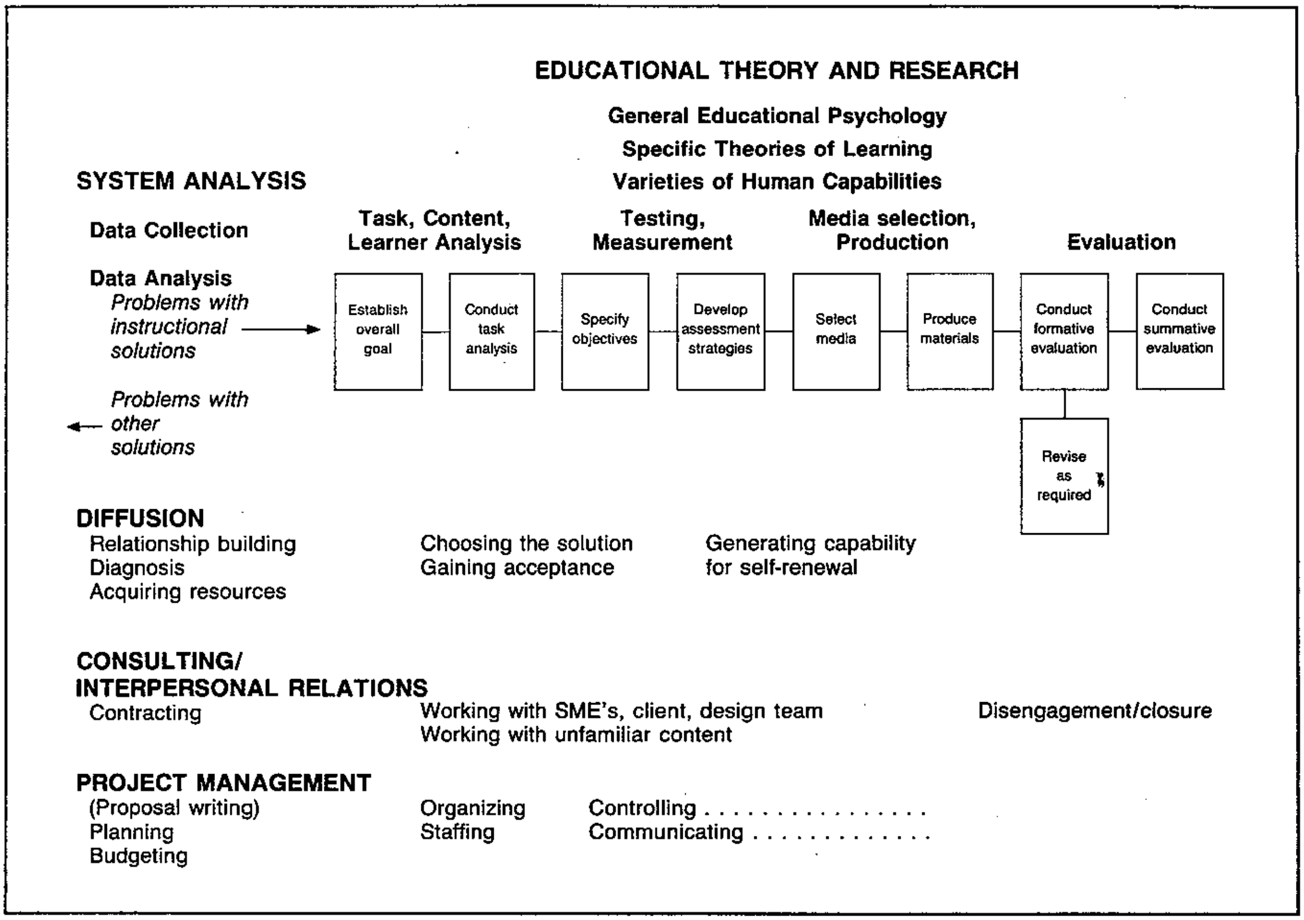

Figure 5. Instructional systems design view.

the research and strategies of diffusion will eventually be faced with the task of trying to assure successful adoption of whatever product or program has been produced. While luck, persuasiveness, and managerial mandate may aid the "diffusion-less" designer, the history of innovation would suggest these as highly unreliable techniques.

In short, the proper practice of ISD brings all the skills, knowledge, and attitudes shown on Figure 5 to bear on the problems of a particular system in an orderly and precise manner. Furthermore, there is (or should be) a symbiotic relationship between the major categories. Designers' knowledge and skill in one area supports their work in other areas, as will be seen in the following description of the instructional systems design view.

Educational Theory and Research

General Educational Psychology

Designers should have an understanding of the principles of human physical, emotional, social, and mental growth and development. A knowledge of how socioeconomic status, IQ, sex differences, cognitive styles, creativity, and motivation may affect learning is also important. This background provides valuable insight into the characteristics of different target populations.

Specific Theories of Learning

A solid foundation in learning theory is undoubtedly the most essential element in the preparation of ISD professionals because it permeates all other dimensions shown on Figure 5. Designers must be familiar with the theory and research on learning and must be able to apply it to actual practice. For example, a designer working on an early childhood education project will find insight into children's behavior and the value of a rich learning environment in the work of Piaget (1954). Ausubel (1968) and Rothkopf (1970) are valuable resources when producing textual materials. Designers familiar with social learning theory (Bandura, 1986) will not ignore environmental factors that significantly affect instructional programs, nor overlook the power of informal learning channels (e.g., observational learning). Bruner's (1973) rich philosophical insight into discovery learning and problem solving, Keller's (1983) work on motivation, Knowles' (1984) emphasis on factors that facilitate adult learning, and the work of others contribute to a designer's overall understanding of the learning process and skill in designing instructional strategies.

Cognitive science (Klatzky, 1980; Anderson, 1980; Gagne, E., 1985; Wildman & Burton, 1981) is making a major contribution to our understanding of how humans perceive, process, store, and retrieve information. Schema theory, elaboration, metacognition, automaticity, expert/novice studies, and transfer are only a few of the constructs studied by cognitive psychologists that have important implications for the design of instruction.

Without a broad-based foundation in learning theory the practice of ISD becomes narrowly focused on means (the steps in the systems model) rather than on the rightful end (learning). Academics must provide students with a solid background in the relevant literature; practitioners must be sure on-the-job exigencies do not preclude the infusion of learning theory into design and production procedures.

Varieties of Human Capabilities

ISD professionals must be able to distinguish between psychomotor skills and intellectual skills; attitudes and cognitive strategies; and skills requiring memorization of information and those requiring the application of previously learned information to problem situations (Gagne, R., 1985). This knowledge enables them to take advantage of research on the particular conditions under which each type of human capability is most likely to be learned. Thus, a unit intended to formulate or change attitudes will use entirely different instructional strategies than one composed primarily of verbal information.

Knowledge of human capabilities also enables a designer to be certain that the objectives of an instructional unit truly reflect the needs of the system. Training journals complain that classroom instruction does not transfer to on-the-job competence (Broad, 1982). One explanation for this is that the objectives of classroom instruction often do not match on-the-job requirements (e.g. a class presents and tests only verbal information when job requirements call for application of the information to novel situations). A thorough understanding of the attributes of each type of learning is insurance against such errors.

Finally, this knowledge guards against the trivialization or unnecessary simplification of instruction that occurs when (a) the objectives for a unit require only low-level learning, and/or (b) objectives are written only for skills that can be easily evaluated (e.g., by machine). ISD professionals must be alert to these issues. In relation to the former, they know that objectives can and should be written for higher intellectual skills: analysis, synthesis, problem solving, problem finding, etc. In relation to the latter they know that the problem is one of measurement (there *are* ways to measure achievement in problem solving, after all) and professional integrity (should a unit be designed that does not truly provide the skills required by the system?).

Task, Content, Learner Analysis

Task analysis has always been viewed as a critical and difficult step in the design of instruction. A traditional, behavioral orientation calls for breaking a goal into subgoals, thereby identifying essential prerequisites and mapping a logical sequence for presenting the content.

Cognitive science has broadened the concept of task analysis to include an analysis of the content itself. Such an analysis aims at determining the relationship between, and relative importance of, individual concepts within a body of content. One value of this relates to the presentation of material:

> What happens as readers try to progress through text material, for example, is that single ideas, concepts, rules, and other elements must be eventually integrated into some holistic structures organized around a few powerful ideas. The learner's task in this case is greatly facilitated when the content in question is well organized (Wildman, 1981, p. 17).

Another use for this information is to provide organizational and conceptual strategies such as advance organizers (Ausubel, 1968) or frames (Ambruster & Anderson, 1985) that learners can use to aid their own comprehension and retention of information.

A second cognitive perspective emphasizes the need to be aware of how students will process a particular body of content. Shulman (1986), for example, asserts that "pedagogical content knowledge also includes an understanding of what makes the learning of specific topics easy or hard" (p. 9). This idea considers how students' prior learning (or lack thereof)—both of content-specific information and cognitive strategies—may affect their success with a particular instructional unit.

The behavioral and cognitive orientations combine to suggest a challenging three-fold approach to task analysis: analysis of (a) the task, (b) the structure of the content, and (c) the learner. A grounding in learning theory and knowledge of the types of human capabilities will prove valuable during this complex process.

Testing, Measurement

On a large ISD staff, evaluation/measurement specialists may design the instruments and evaluation procedures. However, without a solid background in testing and measurement (Gronlund, 1981), designers are ill-prepared to (a) establish appropriate criterion levels for objectives (Thorman, 1982), (b) select appropriate assessment strategies for a particular target population, system and learning environment constraints, or type of human capability (Gagne & Beard, 1978), or (c) design instruments when necessary. They should be able to develop valid and reliable needs assessment instruments, various kinds of paper/pencil tests, attitude surveys, and observational checklists.

Media Selection, Production

Designers use their knowledge of learning theory and the varieties of human capabilities to make media selection decisions (Reiser & Gagne, 1983), as well as their knowledge of the extensive research on media (Schramm, 1977; Levie & Dickie, 1973). For example, pictures may be used to facilitate long-term memory, realistic, dramatic presentations for encouraging attitude change, print or graphic advance organizers before presenting a large amount of verbal information, video segments for teaching motor skills, etc. Cost, time, and logistical factors also play a major

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must also be studied. A designer's background in general educational psychology, learning theory, and the varieties of human capabilities provide excellent insight during this process.

When all relevant data are collected, they are analyzed to determine whether there are any gaps between what is and what should be (Kaufman and English, 1979). It is here that a designer separates those needs for which training is the appropriate solution from those with motivational or environmental solutions. Hence costly instructional programs are undertaken only when the system analysis deems a project worthy, appropriate, practicable, and likely to succeed. Because of their analysis, consulting, and managerial skills, designers often are qualified to recommend noninstructional solutions (e.g., changes in office information flow or managerial styles) as well as instructional ones.

Diffusion

Havelock (1973) lists six steps (shown on Figure 5) necessary to bring about change in an organization. It should be noted that a well designed system analysis incorporates four of these steps: (a) a good relationship with the client is built and the designer's credibility established; (b) the problem(s) of the system are diagnosed; (c) all relevant resources are acquired; and (d) members of the system potentially effected by the innovation view the idea favorably because they (or at least key personnel) have been involved in the system analysis phase in some way. Once the solution for the project is chosen, the designer must see that the new instructional product or program can be maintained easily by the system. An understanding of the process of change, resistance to change, and categories of adopters (Rogers, 1983) prepares the designer to work sensitively and persuasively with different members of the role in making media selection decisions (Clark & Salomon, 1986) as do the resources and constraints of a particular system. Production specialists (graphic artists, video production personnel, computer programmers, photographers) are often engaged once design specifications have been formulated. However, designers must know the capabilities of all forms of media and technology (including the most recent advances in interactive video and telecommunications) so that they know when and how each can be used appropriately. Knowledge about production techniques also improves the designer's ability to communicate with technical specialists working on a project.

Evaluation

The last subcategory under educational theory and research deals with the evaluation of instructional products and programs. Knowledge of evaluation theory and techniques, both formative (Dick & Carey, 1985) and summative (Tuckman, 1979) is essential since on this rests the ability to assess the effectiveness of the entire ISD process. Designers will benefit from a knowledge of quantitative and qualitative (Cook & Reichardt, 1979) methodologies.

System Analysis

System analysis is divided into two subcategories in Figure 5: data collection, and data analysis. First, designers must know the goals, functions, resources, constraints, chain-of-command, and culture (Schein, 1986) of the organization in which they are working. Data must be gathered on the specific target populations within an organization to determine their general characteristics, motivation, sophistication as learners, and performance levels. (This information will be useful again during the task analysis phase.) Typical learning environments in the organization (formal, small group interaction, grapevine, on-the-job training, etc.) client group while working through the steps of diffusion.

Consulting/Interpersonal Relations

Bell and Nadler (1979) list the phases of a consultancy as entry, diagnosis, response, disengagement, and closure. These parallel the diffusion steps, yet emphasize the professional (and possibly contractual) relationship between the designer and the client. Writing contracts (Walter & Earle, 1981-82), determining the appropriate style of consultancy for a particular client, and knowing how to disengage from and conclude a consulting agreement (Davis, 1975) are among the consulting skills designers should possess. Interpersonal and small group interaction skills (Tubbs, 1978) prepare designers to work successfully with subject matter experts (Coldeway & Rasmussen, 1984), clients, and other designers. The ability to work with unfamiliar content (Bratton, 1981) is another essential skill for designers.

Project Management

Knirk and Gustafson (1986) list five stages of project management (shown on Figure 5): planning, organizing, staffing, budgeting, controlling, and communicating. Craig (1976) offers specific guidelines for many of these functions. In some cases, designers must also be able to write proposals for project funding. Cost-benefit analysis (Head & Buchanan, 1981), general writing skills (Booher, 1982), and platform skills (Schleger, 1984) round out an array of organizational, managerial, and communication competencies for successful project management.

Summary

A summary of the instructional system design view serves as a rebuttal to much of the criticism of the field:

- The main emphasis of instructional systems design is not the use of hardware . Although very important, hardware is but one of the tools designers may use to address the problems of a given system.
- The main emphasis of instructional systems design is not production. Production styles and technical superiority are viewed as aids to instructional effectiveness and not ends in themselves.
- Designers do not assume that training is the solution to every problem. They use system analysis procedures to deter-

mine where training is justified and where it is not.

- ISD is more than a simple method. It is a field requiring a wide range of psychological, sociological, interpersonal, and managerial skills if it is to be skillfully and creatively practiced. This is not to say that classroom teachers and others cannot master and benefit from basic ISD procedures. However, professional instructional systems designers must be prepared to design for different system constraints, populations, content areas (often unfamiliar ones), and forms of media and technology.
- Instructional systems design is rigid, mechanistic, and linear only in its insistence on systematic planning. It does not, for example, allow for inadequate, haphazard planning when the costs of production are so high and the stakes (individual and organizational development) even higher. Charges that ISD is antihumanistic are groundless. Designers with a background in educational psychology, learning theory, human capabilities, system analysis, and diffusion are fixed on the development of human potential and organizational health as primary goals.
- Although ISD clearly has roots in behavioral science, it is not in itself a learning theory—behavioral or otherwise. A designer may draw upon any number of psychological orientations depending on a given task and target population.

Recommendations

Although the preceding discussion has answered the common criticisms of the field, a concluding list of recommendations will be presented for consideration by ISD professionals.

1. The literature of the field sometimes promulgates distinctions between terms like instructional design and instructional development, instructional technology and educational technology—often with only the difference of a word or two. Not only are such fine discriminations confusing, but they tend to semantically chop the field into pieces. Should development really be thought of as in any way *separate* from design? The development of products and programs is inextricably intertwined with the instructional planning that draws upon learning and diffusion theory and system analysis data. Even if the staffing of ISD activities is differentiated, the process is a complex and *unified* one and should be consistently portrayed that way.

2. System analysis, consulting/interpersonal relations, diffusion, and project management skills are often presented as peripheral or even optional to ISD skills. This is unfortunate because the field is made to appear less than it is unless the mutually dependent interaction of these areas is emphasized. Admittedly, each category in Figure 5 has its own literature. Some diffusion literature, for example, even comes from sources outside education. Yet concern for diffusion is (or should be) prominent in a designer's mind long before an instructional goal is ever written. This is the only insurance against design projects that are immediately or eventually rejected by the target population—an unfortunate and unpleasant experience for both client and design team. Hence, diffusion—far from a peripheral skill—must be considered an essential part of the practice of design. The same is true for educational theory and research and the other categories in Figure 5.

Concern for diffusion is, or should be, prominent in a designers mind long before an instructional goal is ever written.

3. There is a bewildering array of titles for academic programs in the field: educational technology, instructional technology, instructional systems, instructional design, instructional development, educational media, educational communications, instructional science, instructional psychology, training, etc. Observers must wonder if titles are synonyms or if each is pregnant with idiosyncratic meaning! Although the situation is unlikely to change, there may be a need to insist on some standards regarding the naming of academic programs. Imagine the development of a new masters program specializing only in the production of interactive video. Can such a program rightfully be entitled "instructional technology"? It seems reasonable that programs using the most common titles of the field (the first five on the list above)—even the ones that seem to emphasize the use of technology rather than design—have a corresponding obligation to be sure their curriculum reflects the scope of the field and not a single specialization.

Conclusion

The purpose of this paper has been to delineate aspects of instructional systems design that must be considered nonnegotiable items. Briggs (1977) defines ISD as:

> A systematic approach to the planning and development of a means to meet instructional needs and goals; all components of the system are considered in relation to each other in an orderly but flexible sequence of processes; the resulting delivery system is tried out and improved before widespread use is encouraged (p. xxi).

Whether in schools or universities, business, industrial, health related, or military training, whenever ISD professionals are at work, they are translating this definition into practice. If they are skillful, they are juggling many sources of information and many kinds of skills with the needs and characteristics of their client. It is an important, fascinating, sometimes exhausting job.

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