Instructional Systems Design and Public Schools

☐ Barbara L. Martin
    Rebecca Clemente

Barbara L. Martin is Associate Professor of Educational Technology, and Rebecca Clemente is a graduate student in Curriculum and Instruction, both at Kent State University, Kent, OH 44240.

A great deal has been written in the last several years about the use or lack of use of instructional systems design (ISD) in public schools. The general discussion has revolved around why ISD has not been accepted by public schools; why instructional design experts have not been hired by public school systems; and primarily what an educational technologist can do to change the situation. The focus of most discussions by educational technologists is: how can schools and teachers alter their practice to benefit from ISD?

In this article, we maintain that one reason why ISD has not been adopted in schools is that there may not be a fit between the philosophies, needs, resources, and constraints of schools and the benefits of adopting ISD. We also argue that for ISD to have a significant influence in public schools, it must be accepted by teachers.

The general question we ask in this paper is this: are we attempting to redesign schools and classrooms to accommodate our technologies with insufficient attention to the perceived needs of clients and to the consequences of adopting ISD? Our approach to answering this question was to search the literature to uncover perceived inconsistencies between ISD theory and practice on the one hand and teacher needs, wants, and practices on the other.

☐ Diffusion campaigns often fail because change agents are more innovation-minded than they are client oriented. [Change agents] "scratch where their clients do not itch" (Rogers, 1983, p. 319).

It is well documented that schools and school systems are not the prime users of instructional systems design (ISD). Branson and Grow (1987) state that a large ISD industry has developed since the 1950s to serve corporate and government markets. The net result of this industry is the development of massive amounts of instruction, training devices, simulators, and other instruction/training related products. They state, however, that the use of ISD has not had similar widespread use in education:

. . . proponents of systematic instruction have wasted millions of hours and even more dollars on in-service training for school teachers, often with the naive hope that those teachers would then improve results through better instruction. . . . Nevertheless, in-service training marches on, and half-implemented projects continue to give ISD a bad name (p. 416).

The fact that ISD has not enjoyed widespread use in public schools leads us to believe that there may be factors associated with it that make it unattractive to users and that inhibit its benefits. In this article, we suggest that more attention needs to be paid to the client, specifically teachers, and their perceptions concerning ISD. To use Rogers' (1983) terminology we ask the question: are educational technology change agents scratching where their clients do not itch? Perhaps ISD has not been adopted and implemented in schools because it is perceived as

inappropriate for schools. In making these suggestions, we have addressed some of the clients' perceptions about adopting ISD, taking into account (a) the factors influencing adoption and implementation of innovations, (b) the beliefs of teachers about their role in the educational process, (c) an overview of how teachers plan for instruction, and (d) the goals of schooling. These factors are then contrasted with ISD theory and practices.

IS ISD AN INNOVATION IN EDUCATION?

An innovation is defined by Rogers (1983) as an idea or practice that is perceived as new to an individual. Whether or not the idea is actually new matters little; if the idea seems new to an individual or a group, it is considered to be an innovation. An innovation usually has two components: a hardware, or products, aspect and a software, or processes, aspect. In some cases, however, an innovation can be constituted almost entirely of the software or the information base of the innovation (Rogers, 1983). Examples of this are a conservative political philosophy and management by objectives.

Although ISD is both a process and a product, as an innovation ISD would most likely fit the latter definition (i.e., an innovation consisting primarily of an information base) because the products developed using ISD rely on a specific process; products developed using processes other than ISD would not be considered an example of the innovation. Even though the products (curriculum guides, computer programs, ISD products) that embody the ISD process can be mistaken for the innovation, it is not the innovation unless ISD processes have been used to develop the products. It is the process component of ISD that is paramount when defining it as an innovation and when diffusing it.

As a process, ISD is defined by Briggs (1977) as "the entire process of analysis of learning needs and goals and the development of a delivery system to meet the needs" (p. xx). Briggs includes in his definition the development of instructional materials,

tryout and revision of instruction, and learner-evaluation strategies. Romiszowski (1981) states that ISD must include three main characteristics: the presence of precise goals and objectives, careful preplanning, and testing out.

As a product, ISD can include instructional materials developed according to specified procedures and practices, such as computer-assisted instruction and self-instructional packages, as well as the development of entire programs of instruction or curricula. These products, however, must be developed using ISD processes to qualify as an example of the innovation.

What is the role of the teacher in the classroom when adopting and implementing ISD? ISD models vary considerably both in terms of how the teacher's role with students is defined and in terms of how the teacher's role in developing, implementing, and adapting ISD products is described. When ISD is being diffused to teachers, how their role is defined vis-a-vis ISD contributes to their perceptions of it and their eventual acceptance or rejection of it.

Characteristics of Innovations

An innovation has five characteristics that influence whether or not it will be accepted or rejected (Rogers, 1983). These characteristics, *as perceived by the potential adopting population*, help explain whether or not an innovation will be adopted. The key word here is *perceived*. How the individuals who will adopt or reject the innovation understand and grasp its essence influences its rate of adoption. Understanding these perceptions helps change agents determine where their clients itch, if in fact they do. The characteristics are: relative advantage, compatibility, complexity, trailability, and observability. This discussion will focus primarily on two of the characteristics usually evaluated as the most critical (Rogers, 1983): (a) the perceived *relative advantage* of the innovation, meaning its economic benefits, its ability to reduce work loads and to save time and effort, its status

aspects, its ability to decrease discomfort, etc., and (b) the perceived *compatibility* of the innovation with the values and beliefs of the client system, including compatibility with previously introduced ideas and the clients' perceived need for the innovation. How *complex* the innovation is perceived to be, that is, how easy or difficult it is to use, also influences adoption and may contribute to the clients' evaluation of it.

Adoption and Diffusion

Because schools are not the prime users of ISD, it is possible that ISD is an innovation that has not yet been diffused to the potential client system. School personnel may be unaware of ISD and, therefore, have not adopted it. If that is the case, then the perceptions the clients have about ISD, particularly in terms of relative advantage and compatibility, should be useful when diffusing it. It is also possible, however, that school personnel have already rejected ISD. If that is the case, later adoption can follow rejection. Again, understanding the perceptions that potential users have regarding ISD may prove helpful.

To whom should adoption efforts regarding ISD be targeted? And what specifically is the innovation we are diffusing? First, it is our contention that one of the primary potential adopters of ISD is the teacher. While bureaucracies, school board personnel, administrators, and parents can play influential roles in facilitating the adoption or rejection of innovations, it is the teacher who ultimately decides what goes on in the classroom. Even when products and texts are disseminated to teachers, they alter and modify them to fit the needs of their particular classrooms. Therefore, teachers' perceptions of ISD are critical. Second, whether teachers design their own instructional materials or implement materials produced by others, to adopt ISD means to adopt the process as defined by Briggs (1977). In particular, adoption means (a) that any materials developed are done so according to the rules and procedures specified by ISD processes, (b) instructional planning conforms to ISD processes,

and (c) implementation of instructional plans and products complies with ISD processes.

THE ROLE OF THE TEACHER IN EDUCATIONAL CHANGE

The traditional view about educational change is that school structure and organizational factors have an enormous influence on what happens in classroom practice (Fullan, 1982; Fullan & Pomfret, 1977; Katz & Katz, 1978; McLaughlin & Marsh, 1978). There are, however, organizational theorists who contend that the structure of the educational bureaucracy has very little influence on classroom activities (Clark & Peterson, 1986; Hechinger, 1988). Citing sociologist James G. March and others, Hechinger (1988) states, "To use their customary term, organizations are *loosely coupled*, meaning, in the case of education, that a bureaucracy's presumed functions are only very tangentially related to what actually goes on in classrooms or in districts" (p. 11).

At the local school level, teachers' influence on classroom practice is significant. Burkman (1988) states that it is teachers who play a strategic role in what occurs in the classroom because of their key membership on curriculum committees. Teachers assist in determining the syllabi and the instructional materials used in the district. In addition, while policy may be set by the superintendent and the school board, "instructional practice is mostly determined by the teacher after he or she closes the classroom door" (p. 31). Bureaucracy notwithstanding, the key player in classroom instructional decision-making, according to Burkman (1988), is the teacher.

Some educational technologists interested in diffusing ISD into schools have focused their attention on the need for organizational changes (Branson, 1988; Reigeluth, 1988), while others have addressed local school efforts capitalizing on the role of the media specialist (Schriffman, 1988) and the role of staff development (Shrock & Byrd, 1988) to deliver the ISD message. Both Branson (1988) and

Reigeluth (1988) argue that fundamental redesign of the operating concepts and models of schools must occur before any significant improvements can be made in public education. For example, Reigeluth (1988) states that it is the structure of the present educational system that is at the core of current educational problems. He argues that the present "group-based, lock-stepped, graded, and time-oriented system" (p. 3) is dysfunctional and that it restricts the use of nonhuman resources, such as computers, in effectively educating students.

Branson (1988) also argues that the present educational system cannot be improved without major structural changes. He states that the schools are operating at approximately 97–98 percent efficiency and they have approached their practical upper limit of performance. He argues that there is little room for improvement *under present operating conditions*, perhaps 2–3 percent, and that the costs of such improvement outweigh the results.

While we agree that widespread organizational changes may be necessary, it is unlikely that massive changes will occur in the near future. Change proceeds in an evolutionary manner, in successive approximations. Successive approximations can occur in a number of ways, from massive changes involving many variables on a small scale, to small changes involving few variables on a large scale, and anything in between. It may also be possible that significant changes can be made under present operating models and concepts. If so, what variables may have the greatest impact on education, specifically student learning? There is evidence to suggest that the critical variable is the teacher and his or her relationship within the social system of public schooling (Burkman, 1988; Clark & Peterson, 1986; Hechinger, 1988; McCutcheon, 1980; Smylie, 1988). This relationship is fundamentally linked to teachers' perceptions of their roles in education, their perceptions of a given innovation and its quality. For example, Shrock and Byrd (1988) suggested that teachers rejected behavioral objectives because they did not have a cognitive structure in which to place objectives

and, therefore, did not know what to do with them. An alternate explanation is that teachers rejected behavioral objectives because they perceive them as having little relative advantage and as being incompatible with their values.

Factors in the Adoption or Rejection of Innovations

When teachers adopt or reject an innovation, what factors are influential? In a discussion of the reform proposals for schools, Reid (1987) states that there are three interacting factors that affect change in education. First, *social system* refers to the relationships that exist between those who live and work in an institution. Second, *technology* refers to practices and procedures used in an institution. He uses the example of classroom recitation as one example of technology in a classroom. Finally, *theory* refers to the purposes of an institution, why the institution exists, and how it influences and is influenced by the larger society. Theory refers to how the institution is "embedded in a wider pattern of societal rewards, obligations, and aspirations" (Reid, 1987, p. 11).

Fullan (1982) also uses a multidimensional analysis to describe implementation of innovations in schools. Using the classroom as the unit of analysis, he states that three components are at stake when implementing any new change. First, changes can be made in *materials* (i.e., the instructional resources), such as curriculum materials or technologies that can be new or revised. Second, alterations can occur in *teaching approaches*, defined as the strategies and activities that are used. Third, changes can occur in *beliefs*. These would include the underlying pedagogical assumptions and theories associated with any new program.

Fullan argues that all three dimensions of planned change are necessary because, taken collectively, they represent the change. It is possible, he notes, that an individual may implement only one or two aspects, but that real change implies attention to all three dimensions. "The point is that educational pro-

grams do have an objective reality which may be more or less definable in terms of what beliefs, teaching practices, and resources they encompass" (p. 34). For example, change in only one aspect may accomplish certain goals, but may not represent the fundamental changes desired by the institution or by the people within it. Reid (1987) concurs by stating that if a change affects only one or two of the components, then disequilibrium occurs. How important each component is to successful change is unclear. If the teacher is used as the primary unit of analysis and adoption of ISD is examined in terms of the variables for change described by Reid (1987) and Fullan (1982), how beneficial and useful is ISD in the school setting? What perceptions do teachers have about the relative advantage of ISD compared to other approaches? How compatible is ISD with teachers' beliefs about how instruction should be planned and implemented?

THE TEACHER IN THE CLASSROOM

In this section teachers' needs and attitudes are discussed in relationship to the variables described by Reid (1987) and Fullan (1982): (a) the social system, (b) technology, materials, and teaching approaches, and (c) theory.[1] The underlying pedagogical assumptions and theories associated with ISD (what Fullan called *beliefs*) are also discussed. Since these categories are not discrete, there will be some overlap.

The Social System

The social system is described as the relationships that exist among those who live and

work in an institution (Reid, 1987). In the context of the classroom, our focus is on teacher-student relationships. What do teachers believe about their role in the classroom and about their relationships to students?

First, teachers view their role as one of considerable importance with a direct relationship to student learning and achievement. In a study on staff development by Smylie (1988), a path analysis was used to determine the direct and indirect effects of antecedent variables on changes in individual teacher practice. The purpose of the study was to determine which of three groups of antecedents—psychological antecedents, the classroom environment, and the interactive contexts of schools—had the most influence on improving individual teacher practice. Findings indicated that the largest single predictor of teacher change had to do with teachers' perceptions and beliefs about their own practice, specifically their ability to influence student learning. "The direct relationship between personal teaching efficacy and change suggests that teachers are more likely to change their behavior in directions that may improve their classroom effectiveness if they believe that they themselves are instrumental to the learning of their students" (Smylie, 1988, p. 22).

Similarly, Olson (1981) found that teachers engaged in high-influence teaching (i.e., "teacher as prime mover," p. 266) were more productive and had better feelings about teaching. For example, teachers who were provided innovative materials that put them in a low-influence role adapted the materials so that they perceived themselves as having higher influence in facilitating student achievement (Olson, 1981). Teachers tend to prefer new approaches that maintain their influence in affecting student achievement, not those innovations that decrease it. The widespread adoption and use of the overhead projector allowing high influence in teaching may be testimony to this fact.

Second, in addition to affecting student achievement, teachers also see their role as one where they are responsible for the development of good relations among students

---

[1]The purpose of this section and those that follow is to describe teachers' beliefs, decision-making, planning approaches, and classroom instructional strategies according to how they are described in the literature. Since we are focusing on teachers' perceptions about classroom instruction, our discussion revolves around what we perceive their point of view to be. Any discussion of what we believe teachers should be doing has been omitted.

and between themselves and students. Teachers' belief systems stress "positive relations between teachers and students, a constructive classroom social system, and humanistic approaches to instruction" (Clark & Peterson, 1986, p. 291). Teachers are generally highly focused on classroom interactions and social organization. This is contrasted with administrators' belief system stressing "student achievement on standardized tests, abstract models of classroom learning, administrative evaluation, and the influence of outside forces on classrooms" (Clark & Peterson, 1986, p. 291).

If teachers associate ISD with instructional practices that remove them from a primary role in the classroom, conflict about adopting ISD can occur. For example, ISD models have paid little or passing attention to interactive classroom teaching and group processes other than specifying obvious instructional practices for classroom teaching (e.g., appropriate practice activities and corrective feedback). Some mention is made of group activities and large-group discussions; however, by far the bulk of work related to classroom teacher use of ISD has gone into describing and using objectives, sequencing instruction, selecting media, and writing appropriate assessment devices. In addition, ISD products, for example, individualized instructional packages, often put teachers in secondary roles where they are responsible for monitoring and guiding student learning rather than for direct teaching. While the field may have moved beyond the desire to "teacher-proof" instruction, our models still deal more explicitly with the selection of content and the design of materials than with teacher decision-making or with teacher-student relationships. The extent to which ISD is perceived as an innovation that reduces direct teacher influence in student learning, that minimizes teacher-student relationships and constructive social relations, and that increases administrative needs and goals *may* be directly related to its acceptance or rejection. Such beliefs about ISD are incompatible with teachers' belief systems (Clark & Peterson, 1986; Olson, 1981; Smylie, 1988). We will have more to say about this in a later section.

Technology, Materials, and Teaching Approaches

Adoption or rejection of an educational innovation is influenced by the instructional practices and procedures, strategies and activities, and instructional resources that are diffused with an innovation. Reid (1987) and Fullan (1982) used the terms technology, materials, and teaching approaches to refer to the educational practices and materials that are part of the innovation. These would include hardware systems, ISD software, use of objectives and criterion-referenced assessment, use of group learning activities, etc. Rather than address the myriad technologies and delivery systems that are often associated with ISD, this discussion revolves around teachers' perceptions of their influence in the learning process, specifically how teacher influence or lack of it affects what technology, materials, and teaching approaches are adopted.

What does ISD have to offer teachers in the way of materials and instructional approaches that would promote its acceptance? Olson (1981) discovered that high-influence teaching, "teacher as prime mover," "teacher as navigator" (p. 266), was important to teachers in his study. This perception came into conflict when eight science teachers were asked to implement an innovative science curriculum (English Schools Council Integrated Science Project). The curriculum developers had formulated the program to include little teacher input. The design of the science program was based on a Gagné-type learning hierarchy and was developed using ISD practices, e.g., goals tightly related to methods, criterion-referenced assessment (Olson, 1981).

Olson found that the teachers had a very expressive vocabulary to describe aspects of high-influence teaching. Yet, when asked why the science program was difficult to implement as designed, the teachers groped for phrases and words to describe the problem. Olson contends that the teachers viewed themselves in a weak position as they attempted, initially, to use the program as de-

signed. Not only were they unable to understand and use the "mentalistic events" associated with Gagné's hierarchy to plan for teaching and evaluation activities, they also saw themselves placed in a background role. They were also not familiar enough with low-influence teaching to know how to implement the program. To relieve the friction between their perceived role and the design of the program, teachers adapted the materials for use with familiar, reliable methods. "In short, after a period of experimentation during which they saw their influence declining, the teachers re-established influence through varied domestications of the project doctrine" (Olson, 1981, p. 265).

Could this notion of high- vs. low-influence teaching also explain why other materials and procedures designed and diffused by instructional designers have not been adopted as educational technologists had hoped? Individualized instructional packages, CAI programs, and other preplanned curricular packages may be underused by teachers or not used at all because they put the teacher in a weak position to influence student learning directly and to form positive relationships in classrooms. Olson (1981) argues that innovators must begin to use and understand teacher's language and perceptions when designing innovations. "This implies a much closer contact between teachers and innovators at the level of ideas; not at the level of trials of materials and glossy promotions already couched in new [innovator] languages" (p. 272). Perhaps this is a fundamental reason why Branson and Grow (1987) lament, "Nevertheless, in-service training marches on, and half-implemented projects continue to give ISD a bad name (p. 416)." Projects may be half-implemented because they are perceived by teachers as difficult to understand and to use, and because they are incompatible with what teachers perceive their classroom role to be. Rather than blaming teachers for half-implemented projects, perhaps blame should be placed on those who diffuse ISD because we have failed to attend to teacher's needs, wants, and practices. A case in point is how teachers plan for instruction.

Teacher Planning Approaches

Researchers have learned a great deal about teacher planning behavior. Decisions made during teacher planning affect what teaching approaches, technology, and methods and materials are ultimately used in instructional situations. While ISD is often prescriptive about planning procedures, actual teacher planning does not conform to ISD practices although teachers use many aspects of ISD. Diffusion of ISD into schools may partly hinge on the differences between what teachers and ISD perceive as "good" planning and the relative advantage (or lack of it) of ISD planning over other approaches.

Lesson planning or preplanning for instruction is only one component of teacher planning. There are two planning phases: "pre-active" and "interactive" (Yinger, 1979). The pre-active phase occurs when teachers are not with their students. During this phase the teacher may be involved in marking papers, setting up for a project, thinking about particular students in the class and how to help them academically or behaviorally, preparing lesson plans, and other similar activities. The interactive phase is described as the time spent instructionally with students. The teacher may be actively involved in a lesson with one student, several students, or the whole class. Teacher planning occurs during both the pre-active and interactive phases and is defined as "any activity of a teacher that is concerned with organizing his or her school related activities, or the activities of students, other teachers, aides, parent volunteers, and so on" (Clark & Yinger, 1980, p. 6).

One of the prime differences between teacher planning behavior and ISD is that teachers use mental plans to guide the instructional process rather than written plans. Morine-Dershimer (1978–79) states that a mental plan is a deeper component of a teacher's plan; it is defined as:

The teacher's detailed and comprehensive mental image or set of expectations for the lesson as opposed to a given written lesson plan. It is this mental plan which the teacher carries into the interac-

tive phase of the lesson and which appears to guide interactive information processing (p. 85).

On the relevance and significance of this mental image, McCutcheon (1980) states that "mental planning is probably the part of teaching that has the potential for being the most professional activity of teaching, for it gives teachers the opportunity to relate theoretical knowledge to particular cases" (pp. 8–9).

These researchers have suggested that teachers rely more heavily on mental plans than on written plans. Morine-Dershimer (1978–79) stated that written lesson plans are seldom followed as written; decisions are made on important aspects of the lesson determined during the pre-active phase that were not included in the written plan. In a study by McCutcheon (1980), she found that written plans functioned as (a) a checklist to remind teachers of what was to be completed, (b) something required by the administrator, and (c) in a more expansive form, a guide to substitutes. Mental and "outline" plans may be one reason why Snelbecker (1988) found that teachers believe they are "already doing [ISD]."

In a study by Clark and Yinger (1980), teachers indicated that weekly planning was first in importance. Many of the teachers were required to write daily lesson plans, and many included objectives, learning activities selected based on the objectives, and selection of an appropriate evaluation method. The breadth of the plans, however, ranged from sketchy to detailed, and teachers seldom followed the plans explicitly (McCutcheon, 1980).

"Formative" Evaluation

In the classic ISD sense (Dick, 1977; Dick & Carey, 1985; Gagné, Briggs, & Wager, 1988) teachers rarely engage in formative evaluation. There is, however, evidence to suggest that teachers do engage in loosely defined formative evaluation procedures. These procedures are not formal; yet, the modifications and adaptations they make in instructional

procedures, strategies, and materials are also not arbitrary. Teachers are continually testing their plans, whether mental or written, during the interactive phase of instruction based on perceived discrepancies. These changes are based on gathering data about student abilities and knowledge, and include altering the methods or techniques used, and the amount and sequence of content that is desirable to fulfill the "goals" of the lesson. Mental plans that focus on complex interactions among students, teachers, materials, content, and context, rather than written plans, are used as the basis for on-going adjustments that take place during the interactive phase of instruction. Teachers have established "routines" that they use to judge the adequacy of their lessons and to make revisions. ISD generally requires that formative evaluation be completed prior to implementing instruction rather than during the interactive phase. To be consonant with teacher planning processes, formative evaluation could be diffused and promoted as a way of thinking, the process component of ISD, rather than as a set of procedures for formalizing materials prior to instruction.

To summarize this section on technology, materials, and teaching approaches, a brief review of possible teacher perceptions concerning ISD follows. First, teachers prefer methods and practices that emphasize their efficacy. The extent to which ISD is perceived as an approach that minimizes efficacy may have a negative influence on its adoption. Second, teachers prefer practices that optimize instructional group processes and interactive classroom activities among teachers and students, or among students. The instructional theory developed by Collins and Stevens (1983) based on an inquiry approach could be used as an example of an ISD approach using interactive instruction. In this model, teachers modify and alter their questions directly on student responses. How many other explicit interaction models exist and how often are they diffused to teachers? Third, if teachers perceive that ISD, with its emphasis on objectives and criterion-referenced assessment strategies, requires more formal planning than that in which they nor-

mally engage, they may reject ISD in favor of approaches that they perceive as less rigid and formal, approaches that can be used with their more familiar mental planning. While some ISD authors state that teachers do not need to write objectives and lesson plans, but rather need to think about them (Sullivan & Higgins, 1983), teachers may associate ISD with written objectives and lesson plans. Adoption is often influenced by the perceived compatibility of the present innovation with previously introduced ideas. Perceptions that teachers have about behavioral objectives and their relative advantage in promoting good educational practice may influence adoption of ISD. Finally, teachers often view the need for written plans as part of the administrative purposes and goals of schools. The extent to which these plans are perceived as similar to ISD may also influence the acceptance or rejection of ISD.

Theory: The Purposes of Schooling

Reid (1987) uses the term *theory* to define the purposes of an institution, why it exists, and its relationship to society. Institutions rely on theories to define what they are about. For example, educational theories define what schooling is and should be, how teachers should relate to students, what educational practices should be used, and so on. While considerable research and writing has been done that attempts to answer questions about the purposes of schools, the complexity of this category makes it unwieldy. In this section, we attend to the differences between teachers' and administrators' views of the purposes of schools in an attempt to understand why ISD has not been widely adopted in school settings.

Fullan (1982) states that there are at least two major purposes of schools. He labeled them as cognitive/academic and personal/social-development purposes of education. The first purpose, cognitive/academic, is to educate students in the various disciplines including cognitive skills and knowledge. The second purpose, personal/social-develop-

ment, is to provide students with individual and social skills needed to function in the world of work and in the social and political structure of the society. The latter skills are often embedded in the "hidden curriculum" while the former are more typically seen in formal curricula and instructional plans.

McNeil (1981) also states that there are two goals of schooling, but rather than addressing goals from the vantage point of what schools are intended to do for students, she approaches the purposes from the point of view of administrators and teachers. She says that there are "credentialing" goals and there are educational goals. Credentialing goals are those related to processing masses of students and ensuring that they satisfy diploma requirements. These goals are administrative and bureaucratic. In contrast, educational goals are those that are designed to educate students by enhancing their learning and passing on the culture. These are primarily the goals of teachers.

These two goals of schooling, says McNeil, are in serious conflict with one another. The bureaucratic goals often require that teachers expend considerable time and energy on non-teaching activities at the expense of what teachers perceive as educating learners. "In the structure of schooling we embody this conflict: we set up the individual teacher in the classroom to educate our children, but we place that classroom in a large bureaucracy organized to oversee the awarding of credentials" (p. 334). She goes on to say that when the bureaucratic goals begin to control the educational goals, teachers tend to react in ways that reduce educational quality rather than enhance it.

These two conceptions of the goals of schools may have a great deal to do with the fit of ISD and schooling. First, regarding the academic versus personal/social-development goals that Fullan (1982) discusses, the question can be raised: how much does ISD have to offer schools in fulfilling these purposes? Presumably, ISD would be useful in helping teachers and schools develop and implement curricular and instructional plans for academic goals. Is the same true for the personal/social-development goals?

In discussing the social system of the classroom, Clark and Peterson (1986) stated that teachers have a belief system that stresses humanistic approaches to instruction, that is, approaches designed to facilitate personal growth and development. These can include affective goals and/or strategies that promote creativity, self-concept, mental health, etc. To what extent does ISD incorporate strategies that promote humanistic goals into classroom materials and procedures, or identify instructional goals in the affective domain? For example, drug and sex education are as much concerned with changing attitudes and values as with increasing cognitive knowledge. Other curricular and/or instructional programs may also require attention to affective goals (e.g., promoting a positive attitude toward science or English).

While ISD models, theories, and practices have been designed to address personal/social-development goals (Gagné, Briggs, & Wager, 1988; Martin & Briggs, 1986), to what extent have they been diffused to teachers? If it is the case that humanistic approaches and goals are important to teachers, perhaps instructional design is not widely used because it has not attended to humanistic goals and approaches during diffusion efforts. Or ISD may not be perceived as being as useful in fulfilling these goals of schooling as are some other approaches. Perhaps, too, instructional designers and teachers have different definitions of humanistic practices.

Second, regarding the bureaucratic vs. educational goals that McNeil (1988) describes, it may be that ISD is seen as part of the problem rather than part of the solution. If teachers view writing objectives, criterion-referenced testing, and other instructional design practices and strategies as part of the controlling and credentialing practices related to accountability and standardization, that is, something required by administrators (McCutcheon, 1980), rather than for the enhancement of educational goals and personal efficacy, then ISD practices may be doomed in schools.

It is possible that even if ISD is viewed by teachers as helpful or essential in promoting cognitive/academic goals, it may fail the test in promoting other equally important purposes of schooling and may be perceived as too time consuming. Likewise, since teachers have a finite amount of time to spend in preparing for instruction and working with students, time-consuming written plans (especially if these are associated with ISD practices) may be seen by teachers as circumventing the more important educational goals of schools, teachers, and learners. In short, ISD may lack significant relative advantage for teachers.

Beliefs: Underlying Pedagogical Assumptions

Throughout the previous sections, we have dealt in part with what Fullan (1982) refers to as beliefs, the underlying pedagogical assumptions and theories associated with an innovation. He says that the extent to which the underlying assumptions of the innovation match the beliefs and values of the potential adopting population has a great deal to do with whether or not the innovation will be adopted or rejected. Some critical aspects that should match are: (a) the relationships among members of the social system, (b) the purposes of the institution, and (c) the practices and procedures of the institution. In this last section, we very briefly address the theoretical and conceptual bases of ISD and its fit with public education. Assuming that readers are familiar with the theory bases, we make just a few general comments.

General systems theory is based on the belief that much of the world is ordered and rational. This orientation leads to an emphasis on logical thinking but does not eliminate the need and potential for creativity and spontaneity. As applied to designing instruction, it is a problem-solving model based on rational processes, specifically the scientific method. Whether or not teachers view instruction as ordered and rational is questionable. There may be some aspects of teaching that may not be viewed as lending themselves to an application of systems theory at the classroom level. These include: teacher attention to and emphasis on interactive pro-

cesses, recognition of unanticipated events, spontaneous student questions and responses, and an interest in personal/social-development goals. In addition, systems models are often drawn in a linear format even though the models represent holistic and dynamic relationships among objects. The linear depiction of the models may obscure the dynamic process under consideration.

The starting point in teacher planning often begins with an idea for an activity (Clark & Yinger, 1980; McCutcheon, 1980); this is inconsistent with systems theory unless goals or objectives are also identified. While some instructional designers have suggested that starting with an activity is useful for deriving objectives and evaluation items (Sullivan & Higgins, 1983), others have suggested that such an approach is inefficient. Furthermore, the fact that some teachers do not write objectives and do not think they are useful (Olson, 1981) poses a problem if ISD is linked to systems theory. Therefore, teachers' perceptions of objectives and rational planning processes may be incompatible with the way they conduct instruction and compatible with their perceptions of ISD. This may lead to rejection of ISD.

ISD is also firmly grounded in behavioral theory. "Ultimately, the most fundamental application of behaviorist thought in instructional design is the reliance on observable behaviors as the basis for instruction. Performance, or behavioral, objectives describe goals using action verbs. Test items relate to such statements, and the entire delivery process is directed towards facilitating new learner behaviors. . . . This is an almost universal approach among instructional designers, and it stems directly from the behavioral learning theories" (Richey, 1986, p. 65). The fact that ISD relies on observable behaviors does not mean that it promotes a stimulus-response view of learning; however, that may not be clear to the novice instructional designer.

Opposition to behavioral theory and behavioral objectives often revolves around teachers' beliefs that many important behaviors cannot be stated in behavioral terms

(Briggs, 1982). In addition, breaking tasks down into parts (e.g., learning-task analysis, learning hierarchies) is criticized as mechanistic, leading to a misunderstanding or loss of the "essence" of the stated behavior. Teachers' perceptions about ISD and its relationship to behavioral theory may aid in understanding why teachers may reject ISD.

Information-processing theory is concerned with the internal mental processing of individuals. The human mind is viewed as a processor of information in much the same way that a computer processes information. One criticism of information-processing theory revolves around the human mind and computer analogy (Phillips & Soltis, 1985). Use of this analogy raises questions about such human traits of learners as emotions and feelings and what role they play in the learning process.

Memory is one of the fundamental constructs of information-processing theory. The applications of information-processing theory to instructional design focus primarily on how to promote the retention of learned material (Richey, 1986, p. 70). How a learner codes, stores, and retrieves information and the roles of practice and rehearsal in the learning process are seen as vital to the instructional designer's role of developing effective instruction. Another criticism, however, of information-processing theory revolves around what and how information is stored and the roles of students, teachers, and instructional materials in that process. For example, to what extent is the learner essentially passive in the learning process? How much control should/does the teacher have in ensuring that proper information is "fed in" and that the information is error free?

The theoretical and conceptual bases of instructional design are intimately linked to the beliefs and practices of individuals who practice ISD. The theory bases discussed, plus related others (e.g., criterion-referenced instruction, mastery learning, and competency-based education) are based on assumptions about the nature of the learning process, the way information should be conceived and implemented, the roles of the stu-

dent and the teacher, and ultimately assumptions about the purposes of schooling. Whether or not a particular teacher, school, or school system accepts the underlying assumptions of ISD plays a significant role in whether the practices are adopted or rejected. To what extent is there a fit between teachers' values and teachers' perceptions of the underlying theoretical assumptions related to ISD?

SUMMARY

We began this paper by stating that adoption and implementation of ISD in schools is in large measure dependent on teacher acceptance or rejection; ". . . when implementing a significant curricular, organizational, or instructional change, . . . teachers' belief systems can be ignored only at the innovator's peril" (Clark & Peterson, 1986, p. 291). When teachers' beliefs coupled with teachers' perceived needs and roles are compared with the assumptions and practices underlying an innovation, an assessment can be made of the likelihood of adoption of an innovation. Based on this discussion, conflicts between ISD theory and practices and teachers' perceptions of their role are at least *possible* if not apparent. These conflicts may be partly due to what is being diffused. Is ISD being diffused as (a) a process that can be used during both the planning and interactive phases of instruction, (b) a process for developing written lesson plans, (c) a process for developing and/or using pre-planned instruction, or (d) prepackaged instructional products? Using ISD as a process in conjunction with mental planning may have the greatest chance of adoption.

The recommendation to diffuse ISD as a process to be used during the planning and interactive phases of instruction is based on the following potential conflicts between ISD practices and teachers' perceptions of their practice:

1. Personal teaching efficacy is important because teachers believe that they, not

instructional materials, are instrumental in facilitating student learning.

2. Teachers prefer "high-influence teaching" and modify materials and strategies to fit that role. "Low influence" programs are perceived by teachers as reducing their efficacy and decreasing their instructional decision-making.

3. Teachers use mental rather than written planning approaches, and rarely follow written plans explicitly. Plans often, but not always, include attention to objectives, selection of activities, sequence, and evaluation.

4. Teachers view teaching as a highly interactive process where teacher-student and student-student relationships are very important.

5. Teachers use an informal "formative" evaluation process that is neither arbitrary nor random.

6. Teaching and administrative goals often conflict. Some instructional planning, derived from ISD, may be perceived as necessary to accomplish administrative/bureaucratic rather than teacher purposes. For example, attention to efficiency may more closely fit bureaucratic rather than teacher goals.

7. Even if cognitive/academic goals are recognized as requiring an ISD approach, use of ISD preplanning can be time consuming. It may not be perceived as worth the investment. In addition, ISD has paid less attention to humanistic approaches, group process, and goals related to personal/social-development than cognitive goals.

8. Some of the assumptions that undergird ISD (e.g., general systems theory, behavioral theory, information-processing, competency-based education, and use of technology) may also account for lack of adoption.

These conflicts must be resolved. Before we continue to lament that ISD has not been

adopted, we need to be clearer about the needs (wants?) of teachers and schools, what we have to offer them, and the consequences of adopting ISD. To what extent are teachers' perceptions and misperceptions about ISD influencing their adoption decisions? To what extent are instructional designers' perceptions and misperceptions about teachers and classrooms influencing how and what they diffuse to teachers concerning ISD? Once an analysis of the consequences of adopting ISD has been undertaken, including the needs, wants, and perceptions of teachers, numerous options exist. It may be that ISD meets some of the needs of schools, but not others, and adoption efforts need to be formalized for those goals. Or it may be that ISD should be adapted and modified to meet specific teacher needs and goals. New instructional design models and theories may need to be developed that are student-based or teacher-based rather than materials-based. This includes more attention in our theories to interactive classroom activities. Of course, at the other end of the continuum, the possibility exists that ISD is inappropriate for schools.

In conclusion, we offer a few recommendations for diffusing (and modifying?) ISD so that it might be adopted by teachers under the present operating conditions.

1. Help teachers develop brief written plans that make use of their mental planning process and good ISD practices.

   a) Diffuse ISD planning practices as a problem solving or decision-making model that is fluid and flexible rather than as a completed written plan or one with intact instructional materials; diffuse ISD processes rather than ISD products or how to develop ISD products.

   b) Provide heuristics of ISD explicitly for teacher planning, for example (1) promote selection of activities and media as a first step in planning as long as the objectives are also identified, (2) promote use of ISD for important cognitive objectives (cogni-

tive strategies and intellectual skills) rather than for verbal information objectives, and (3) promote use of ISD for affective goals and objectives.

   c) Demonstrate the use of ISD planning for public school use taking into account time constraints (e.g., shortcuts for writing objectives, sequencing instruction, etc.). Demonstrate how textbooks, products developed by ISD or other approaches, and curriculum plans can be modified according to ISD.

2. Expand ISD theory, models, and practice to include or to be more explicit about prescriptions for classroom size group instruction.

   a) Capitalize on teachers' needs for teacher-student interaction by integrating high- and low-influence teaching using ISD. Make the best use of individualized, self-paced programs and the best use of interactive teaching when each is called for and appropriate.

   b) Include low-influence teaching strategies as part of courses in ISD or in teacher-training courses.

3. Develop informal formative evaluation procedures that take into account teacher modifications and adaptations of instruction during the interactive phase of teaching.

4. Develop materials for classroom use that are interactive, that provide for teacher efficacy and high-influence teaching, and that make use of technological delivery systems. Focus on sound instructional *methods* that can be used by teachers or machines (Clark, 1983).

5. Separate classroom and student achievement benefits of adopting ISD from the benefits that administrators prefer.

6. Diffuse ISD to administrators at the macro level to influence teachers.

   a) Teach administrators how to use ISD for in-service and staff-development activities.

   b) Instruct administrators in ISD for long-range planning.

A pro-innovation bias is defined by Rogers (1983) as "the implication of most diffusion research that an innovation *should* be diffused and adopted, that it *should* be diffused more rapidly, and that the innovation *should* be neither reinvented nor rejected" (p. 92, emphasis added). It is possible that educational technologists have a pro-innovation bias. Regarding acceptance of ISD for public schools, our perceptions may be colored by what we believe is best for our client system. But perhaps we need to take another look. An ISD model that has been adopted for school use taking into account present operating conditions and teachers' perceptions and beliefs about education and learning may be most appropriate. Such a model would be sensitive to the present structure of the school, how teachers plan, and how they implement instruction, and it would retain the best features of instructional systems design.   □

REFERENCES

Branson, R. K. (1988). Why the schools can't improve: The upper limit hypothesis. *Journal of Instructional Development, 10*, 15–26.

Branson, R. K., & Grow, G. (1987). Instructional systems development. In R. M. Gagné (Ed), *Instructional technology: Foundations* (pp. 397–428). Hillsdale, NJ: Lawrence Erlbaum Associates.

Briggs, L. J. (Ed.). (1977). *Instructional design: Principles and applications.* Englewood Cliffs, NJ: Educational Technology Publications.

Briggs, L. J. (1982). Instructional design: Present strengths and weaknesses, and a view of the future. *Educational Technology, 22*(10), 18–23.

Burkman, E. (1989). Prospects for instructional systems design in the public schools. *Journal of Instructional Development, 10*, 27–32.

Clark, C. M., & Peterson, P. L. (1986). Teachers thought process. In M. C. Wittrock (Ed.), *Handbook of Research on Teaching* (pp. 255–296). New York: MacMillan Publishing Company.

Clark, C. M., & Yinger, R. J. (1980). *The hidden world of teaching: Implications of research on teacher planning.* Research series No. 77. East Lansing: Michigan State University, The Institute for Research on Teaching.

Clark, R. (1983). Reconsidering research on learning from media. *Review of Educational Research, 53*, 445–459.

Collins, A., & Stevens, A. L. (1983). A cognitive theory of inquiry teaching. In C. M. Reigeluth (Ed.), *Instructional design theories and models: An overview.* Hillsdale, NJ: Lawrence Erlbaum Associates.

Dick, W. (1977). Formative evaluation. In L. J. Briggs (Ed.), *Instructional design: Principles and applications.* Englewood Cliffs, NJ: Educational Technology Publications.

Dick, W., & Carey, L. (1985). *The systematic design of instruction* (2nd ed.). Glenview, IL: Scott, Foresman.

Fullan, M. (1982). *The meaning of educational change.* New York: Teachers College Press.

Fullan, M., & Pomfret, A. (1977). Research on curriculum and instruction implementation. *Review of Educational Research, 47*, 335–397.

Gagné, R. M., Briggs, L. J., & Wager, W. W. (1988). *Principles of instructional design* (3rd ed.). New York: Holt, Rinehart Winston.

Hechinger, P. (1988). Does school structure matter? *Educational Researcher, 17*(6), 10–13.

Katz, D., & Katz, R. (1978). *The social psychology of organizations* (2nd ed.). New York: Wiley.

Martin, B. L., & Briggs, L. J. (1986). *The affective and cognitive domains: Integration for instruction and research.* Englewood Cliffs, NJ: Educational Technology.

McCutcheon, G. (1980). How do elementary school teachers plan? The nature of planning and influences on it. *The Elementary School Journal, 81*(1), 4–23.

McLaughlin, M., & Marsh, D. (1978). Staff development and school change. *Teachers College Record, 80*, 69–94.

McNeil, L. M. (1988). Contradictions of control, part 1: Administrators and teachers. *Phi Delta Kappan, 69*, 333–339.

Morine-Dershimer, G. (1978–79). Planning in classroom reality an in-depth look. *Educational Research Quarterly, 3*(4), 83–99.

Olson, J. (1981). Teacher influence in the classroom: A context for understanding curriculum translation. *Instructional Science, 10*, 259–275.

Phillips, D. C., & Soltis, J. F. (1985). *Perspectives on learning.* New York: Teachers College Press.

Reid, W. A. (1987). Institutions and practices: Professional education reports and the language of reform. *Educational Researcher, 16*(8), 10–15.

Reigeluth, C. M. (1988). The search for meaningful reform: A third-wave educational system. *Journal of Instructional Development, 10*, 3–14.

Richey, R. (1986). *The theoretical and conceptual bases of instructional design*. New York: Nichols.

Rogers, E. M. (1983). *Diffusion of innovations*. New York: The Free Press.

Romiszowski, A. J. (1981). *Designing instructional systems*. New York: Nichols.

Schiffman, S. S. (1988). Influencing public education: A "window of opportunity" through school library media centers. *Journal of Instructional Development, 10,* 41–44,

Shrock, S. A., & Byrd, D. M. (1988). An instructional development look at staff development in the public schools. *Journal of Instructional Development, 10,* 45–53.

Smylie, M. A. (1988). The enhancement functions of staff development: Organizational and psychological antecedents to individual teacher change. *American Education Research Journal, 25,* 1–30.

Snelbecker, G. E. (1988). Instructional design skills for classroom teachers. *Journal of Instructional Development, 10,* 33–40.

Sullivan, H., & Higgins, N. (1983). *Teaching for Competence*. New York: Teachers College Press.

Yinger, R. (1979). Routines in teacher planning. *Theory Into Practice, 18*(3), 163–169.

In Forthcoming Issues ...

Design and Use of Hypermedia Systems,
by Mable B. Kinzie and Richard L. Berdel

Evaluating Instructional Software, *by Robert A. Reiser and Walter Dick*

Native Peoples of the Southwest: Development of a Multicultural Instructional Program,
by Susan L. Shaffer-Nahmias

Instructional Development and Third World Textbooks,
by Clifton Chadwick

Special Report: Doctoral Dissertations in Instructional Design and Technology, 1977 Through 1988,
by Edward P. Caffarella and Steven G. Sachs