Instructional Theory, Practitioner Needs, and New Directions: Some Reflections

Charles M. Reigeluth
Contributing Editor

The previous articles in this special section have touched on a wide variety of exciting issues and ideas. In this article I reflect on some of the most important of those issues, in my opinion, and even bring up a few issues that weren't raised earlier. The questions I address are: Why struggle with theory? What makes a theory useful? Should I adopt a single theoretical perspective? How adequate are current theories? and What new directions are needed in instructional theory?

Why Struggle with Theory?

I encounter this question a lot, among many graduate students and among many practicing instructional designers. Brent Wilson addressed the attitude that this question reflects, and characterized it as anti-intellectualism. In reading his article, I was left wondering how that attitude develops and what perpetuates it.

My experience confirms Dewey's (1929) statement that "Theory is in the end, as has been well said, the most practical of all things...." And everybody I know naturally develops "mini-theories" about why things work the way they do and what helps them to accomplish goals. Of course, often those mini-theories are wrong, which is the topic of the "misconceptions" research by cognitive psychologists (see e.g., Guzzetti *et al.*, 1993; Kember, 1991; Shug & Baumann, 1991; Zoller, 1990). But the fact that virtually everyone automatically creates theories of their own makes me wonder why many people avoid and denigrate theories.

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Maybe it's fear. Theories can be hard to understand if they are taught abstractly, in which case those of us who teach ISD bear much of the responsibility for the negative attitudes about theory in our field. Bill Winn's article in this issue offers some excellent advice about how to overcome this problem, particularly by integrating theory with practice in our courses on ISD. We in IST at Indiana University have been extensively using this kind of approach, which we call "project-based learning," in our team-taught core courses and several advanced courses; and after three years of trial, error, and revision, we are beginning to believe it is a powerful way to go and is helping to form more positive attitudes toward theory.

Or maybe it's a perception of irrelevance—that theories in the literature don't help people to do their work, in which case we who teach ISD may still bear much of the responsibility. Again, Bill Winn's advice is a powerful tool for dealing with this problem. But the theories and the theorists may deserve some of the blame, also, for not all theories are equally useful.

What Makes a Theory Useful?

I have often written about Herbert Simon's (1969) distinction between the natural sciences and the design sciences (or "sciences of the artificial") (see, e.g., Reigeluth, 1983a). Design sciences (and design theories) are goal-oriented or decision-oriented, whereas the natural sciences (and descriptive theories) are conclusion-oriented. Descriptive theories attempt to describe how things function, whereas design theories attempt to offer means for accomplishing given ends. So which is more useful to practitioners?

Nearly a century ago, John Dewey (1900) called for a "linking science" (design science) between learning theory and educational practice, because learning theory is so difficult to apply to educational problems. As an example, learning theory indicates that new knowledge is acquired by accretion into an existing schema, by tuning that schema when minor inconsistencies emerge, and by restructuring that schema when major inconsistencies arise (Rumelhart & Norman, 1978). But how does that understanding help me to teach quadratic equations? In contrast to descriptive theories, design theories (such as those described in Reigeluth, 1983b) are more directly and easily applied to educational problems. Nevertheless, that doesn't mean descriptive theories are not at all useful to practitioners. As Bill Winn put it in his article in this issue, "any successful practitioner or researcher needs to be thoroughly versed in at least the immediately underlying discipline to his or her own. A good instructional designer knows psychology." Indeed, descriptive theory is useful for understanding why a design theory works, and, in areas where no design theories exist, it can help a practitioner to invent

new methods or select known instructional methods that might work.

Perhaps an overemphasis on descriptive theories in education is partly to blame for many negative attitudes toward theory. Building on Bill Winn's suggestion that theory be taught in a way that is integrated with practice, maybe we should also teach design theories in tandem with their related descriptive theories, and integrate both with practice in our courses on ISD. This would help us to emphasize the relationships between the descriptive and design theories, such as descriptive theory's ability to help us understand why a design theory works, and its ability to help us generate our own design theory when we don't have one that meets our needs. In essence, we professors should teach more design theories vis-à-vis descriptive theories, to help our students understand why and how descriptive theories are useful.

Another aspect of what makes a theory useful was touched on by David Jonassen and his colleagues, who indicate that "we can never be certain of what will happen when we intervene in any process. Reality is contingent—it can only be described probabilistically ...." An instructional method cannot guarantee that the desired learning will occur; it can only increase the probability that it will occur. One major reason for this is what I refer to as conditionality—that a method which works well under one condition may not work well under another. This is a major tenet of chaos theory, for, as David and colleagues put it, "chaos theorists have found that irregular behaviors, once dismissed as unpredictable system anomalies, are actually predictable..." as long as all of the system's initial (and evolving) conditions are known (and, I might add, the conditional relationships are known). Another major reason for the probabilistic nature of instructional design theory is that human beings have minds of their own. David and colleagues identify bias, self-interest, and emotional disturbances as conditions that influence what is learned. Learners also have metacognitive skills to varying degrees, which may allow them to compensate for weaknesses in the instruction.

As a side-bar, I would like to voice concern about Bill Winn's statement that "if outcomes cannot be relied upon to [always] follow from prescribed methods, instructional prescriptions lack validity." Experts frequently use "rules of thumb" to guide their performances. These guidelines could be said to have "probabilistic validity"—that they definitely increase the probability of a certain outcome occurring, although that probability may not have been increased enough to result in the desired outcome in a particular situation. Catastrophe Theory helps explain this phenomenon (see, e.g., Zeeman, 1976).

Based on the above discussion, we can conclude that a theory will be more useful to the extent that it has a design focus and incorporates a wide range of conditionality to account for the probabilistic nature of instruction. Barbara Seels' article offers some helpful insights about the nature of different kinds and aspects of theories.

Should I Adopt a Single Theoretical Perspective?

A few people seem to think that if you adopt one theoretical perspective (e.g,, behaviorism, cognitivism, constructivism), you have to reject all the others. They think of the different perspectives as being incompatible with, or philosophically opposed to, each other. Brent Wilson rightly criticizes Roberts Braden and Dave Merrill for rejecting postmodernism and constructivism, and using "inflammatory imagery" in the process, but this rejectionist attitude comes from some constructivists as well, and in fact was initiated by them. For example, Bednar, Cunningham, Duffy, and Perry (1992) stated: "However, in a process somewhat akin to religious conversion, we have come to question objectivist epistemology. We have adopted what we will call a constructivist view....(T)here is one thing which is very clear: Constructivism is completely incompatible with objectivism" (p. 21). And "...we must adopt a consistent set of assumptions and reject the findings of research and the development of theory based on different assumptions" (p. 31). This rejectionist attitude seems particularly strange coming from constructivists, since a major tenet of constructivism is the value of multiple perspectives.

Epistemological assumptions quickly lose significance in comparison to what works and what doesn't work. Fortunately, most practitioners are too concerned about what actually works to be attracted to the rejectionist view held by some academics on both sides of the objectivist-constructivist debate. They embrace an eclectic view for both descriptive and design theories (see, e.g., Thiagarajan, 1993; in press). Regarding descriptive theory, they realize that every theoretical perspective (including objectivism) has some truth to it—that it captures a part of the whole picture. As I discussed over 12 years ago in this same journal (Reigeluth, 1984), each theory provides a partial understanding of the real world of learning in much the same way that each window in an unknown house provides a partial view of what the inside of the house is like. If we think of different rooms as different kinds of learning, different windows represent different theories, and different theoretical perspectives represent different sides of the house. Sometimes different theoretical perspectives look at entirely different rooms (types of learning), such as constructivism's emphasis on developing metacognitive awareness, as Jonassen and colleagues put it. And sometimes they look at the same room through windows on different walls, in

which case they allow us to see very different things. Different theories and theoretical perspectives are required for different real-world ISD projects, because different projects require knowledge of different rooms in the house, and even different parts of the same room. One of our greatest needs in the field at present is for us to recognize that there are different rooms in the house and that it is essential that we look through more than one window of each room—and from more than one side of the house—in order to get a complete picture of what each room is like.

Regarding design theories, most practitioners understand that different theoretical perspectives offer some different types of tools for facilitating different types of learning (although they also offer some similar tools using different terminology, as I pointed out so meticulously in *Instructional Design Theories and Models*, 1983b). Like a carpenter who needs to be able to deal with all types of conditions (e.g., different woods) and kinds of learning (e.g., different furniture), it is important to be able to use all different types of tools. Some situations call for behaviorist tools, some for cognitivist, and some for constructivist.

The artificial dichotomy between *con*struction and *in*struction is another reflection of the tendency on the part of some people to, as Brent put it, "divide and exclude people." I view instruction as anything that is done to help someone learn. And I view instructional-design theory as anything that offers guidance for improving the quality of that help. Instruction is frequently, but not always, best when it fosters construction. As John Anderson (1982, 1992) has pointed out, the development of complex cognitive skills often requires automatizing lower-level skills through drill and practice.

So, in addition to Brent's concern about provincialism and his advocacy for us all to know about learning theory, systems theory, critical theory, and human factors engineering (and to which I would add communication theory and message- or visual-design theory), I am concerned about a very small but vocal minority who reject some theories and even theoretical perspectives as being useless or philosophically opposed to their own, and I advocate that we know what the different theories in each of those areas has to offer. Eclecticism and multiple perspectives are strengths for practitioners—and even for theorists!

How Adequate Are Current Theories?

To answer this question, let's start by thinking about what we need in the way of instructional-design theory. Consider all the different types of learning that require different methods of instruction (see, e.g., the partial list in Table 1). Attitudes and values and other types of learning in the affective domain are best facilitated in very different ways from cognitive skills and knowledge and other types of learning in the cognitive domain, even though there are cognitive elements to those affective learnings, and even though cognitive and affective learnings are often highly interrelated. And learning of domain-dependent skills (skills confined to a particular subject area) is facilitated in very different ways from domain-independent skills, which represent higher levels of learning, such as what Jonassen and colleagues refer to as "meta-awareness skills," even though both types of skills are often used together. When you consider this full range of types of learning, it is clear that our current theories are not adequate. As Brent Wilson points out, one of the most important questions for our field to address is, "How do you support learning in all its varieties and forms?"

Table 1. A partial list of different types of learning.

- Affective domain
  - Emotions and feelings
  - Attitudes and values
  - Morals and ethics
  - Personal development
  - ...
- Cognitive domain
  - (Subject area) domain-dependent
    - Information and facts
    - Understandings and comprehension
    - Skills
  - (Subject area) domain-independent
    - Learning strategies
    - Thinking and problem-solving skills
    - Metacognitive skills
  - ...
- Psychomotor domain
  - ...

But type of learning is just one condition that can influence the methods our theories need to offer. The nature of the learner is another. As Bill Winn put it in this issue, "the factors that mediate between the perceived stimulus (method) and student performance (outcome) vary greatly in their nature and effect from individual to individual." Two other conditions include constraints on the learning environment and constraints on the ISD process. Again, our current instructional design theories are clearly not providing adequate guidance for these conditions and the diverse methods they require. As Barbara Seels puts it in her article, "the field needs to place more emphasis on explaining complex interactions." Jonassen and his colleagues voice a similar concern when they say that "reality is contingent" and that "our theories should attempt to accommodate some of the irregularity of the world."

The problem is that the more we attempt to account for diverse conditions in a theory (which David and colleagues seem to be advocating in their section on chaos theory), the more we are likely to be criticized for seeking to "micro-manage instruction," as the same authors seem to decry. However, as I mentioned early in this article, I believe that expert teachers have, in fact, developed personal, highly conditional design theories that guide their instructional decisions. The issue then becomes, how can we help novice instructional designers to develop such mental models without them thinking that theory is too abstract and complex? Bill Winn's suggestions for integrating theory and practice can be of great assistance. So can the Elaboration Theory's "simplifying conditions method" (Reigeluth, 1992), which suggests that instruction begin with a very simple yet representative real-world ISD project, and that it gradually progress to more complex projects. The simplest project requires only a relatively simple mental model without much conditionality, and the required sophistication of the mental model grows with each subsequent project.

But can even conditional design theory ever fully meet our needs? I think we can capture much of Bill Winn's "reason and experience" in design theories. However, I don't think that teachers and instructional designers will ever be able to rely 100% on design theory—nor perhaps even 80%. Idiosyncratic and creative factors, in my opinion, count for at least 20% of the possible quality of instruction. But 80% is a lot, and instructional design theories have a long way to go—mostly in previously uncharted directions—before they reach that potential.

What New Directions Are Needed in Instructional Theory?

Wow! There are lots of exciting ideas about this in the preceding articles! Many of them are consistent with the ideas I put forth in an article titled, "A New Paradigm of ISD?" in the May issue of this journal (Reigeluth, 1996). Rita Richey's article—an excellently crafted piece of scholarship—gives some valuable insights about the most recent agendas that are likely to have a powerful impact on the directions that instructional theorists pursue, such as constructivism, cognitivism (especially schema theory), problem-based learning, hypermedia/multimedia, performance technology, electronic performance support systems, and systemic thinking. In keeping with Rita's comment that "the general social and intellectual climate of the times" influences what ideas reach agenda status, I believe that a powerful factor is the major shift our society is undergoing from the industrial age to the information age. As I have outlined elsewhere (Reigeluth, 1995), scholars of this societal shift have identified numerous "key markers" that I believe strongly influence the emergence of agendas (see Table 2).

Table 2. Key markers that distinguish industrial-age and information-age organizations.

Industrial Age	Information Age
Standardization	Customization
Bureaucratic organization	Team-based organization
Centralized control	Autonomy with accountability
Adversarial relationships	Cooperative relationships
Autocratic decision making	Shared decision making
Compliance	Initiative
Conformity	Diversity
One-way communications	Networking
Compartmentalization	Holism
Parts-oriented	Process-oriented
Planned obsolescence	Total quality
CEO as "king"	Customer as "king"

Perhaps the most important of all the key markers listed in Table 2 is the first one, standardization versus customization. In businesses, mass production and mass marketing are giving way as the predominant paradigms to customized production and customized marketing, the latter of which is just beginning to blossom on the Internet. In communications, mass communication is giving way to customized communications, with cellular phones (attached to people rather than places), cable TV shows on demand, and before long the likelihood of video delivery on demand over the Internet, to name just a few. These changes represent paradigm shifts that were made possible by information technologies; and now that people are getting used to them, they are likely to demand them in all spheres of life, including education and training. This means that our instructional theories will need to offer customized instruction.

Bill Winn has long advocated such customization (see, e.g., Winn, 1989), as he does in this issue, where he proposes that methods of instruction need to "be selected or developed 'on the fly' and in immediate response to what students think and do." One very labor-intensive way of doing this would be to provide teachers with a high degree of training in design theory so that they may effectively "reason from first principles," as Bill put it. On the other hand, a machine-intensive way would be to create an intelligent system that could manage a multimedia computer system's interaction with the learner. While both are important, perhaps design theory will need to develop in somewhat different directions for each. Machines can be "taught" very complex interactions of large numbers of conditions and methods, and can collect and remember vast amounts of information

about how each student learns and what each knows. On the other hand, the distinction between such machines and electronic performance support systems (EPSSs) may disappear, as these machines provide on-site training and education—the ultimate case of learning in context. Such machines would provide powerful tools for developing a teacher's expertise in design theory, if they had the capability for the teacher to query them for their rules or other logic behind their instructional decisions. With such tools, teachers might gradually acquire all the complexity that the machines "know," and the EPSSs could help teachers to keep track of all the important information about what each of their students knows and how they learn best. At the same time, I believe that teachers will always have some capabilities that the machines cannot match, so their roles in meeting students' individual needs will likely diverge from (but still overlap to some extent with) the role of the machines.

But customizing instruction is only one key marker of a new paradigm of instructional design theory. I talked at some length about others in the May issue of this journal. The need for this new paradigm, along with developments in constructivism, problem-based learning, character education, and many other areas, have prompted me to begin work on a Volume 2 of *Instructional Design Theories and Models.* The purpose of Volume 2 is to provide a description of the next generation of instructional theories. In contrast to Volume 1 (Reigeluth, 1983b), whose theme was commonality and complementarity among theories of instruction, the theme of Volume 2 is diversity. There are at least two dimensions of diversity, including values (an issue Brent Wilson raises) and kinds of learning (discussed earlier in this article).

Brent proposes that design theory "stands squarely in the middle of value and cultural debates," and he calls for "a closer look at the social and political effects of our interventions." Values have long been overlooked in instructional design theory, in spite of the fact that they play at least two important roles in instructional design. One is that they influence the **learning goals** that are selected. As I mentioned earlier, cognitive and constructivist theories tend to pursue different (higher-level) goals than behaviorist theories, and the decision about what goals to pursue is one that every practitioner must grapple with. This is particularly important, because, as was discussed earlier in this article, different methods (and theories) are required for facilitating acquisition of different kinds of learning goals. Volume 2 will include chapters that focus on learning goals that have until recently received little attention in instructional theory, such as the higher levels of learning and character education.

Another role that values play in instructional design is that they influence **means** for attaining a given goal. There is always more than one way to accomplish a given goal. Which way is "best" depends on what criteria you value for evaluating the alternatives. Those criteria reflect your values, such as "the extent to which learners are in control of their own learning." Volume 2 will include chapters whose choice of methods is based on widely differing values. All of the theories in Volume 2 will make their values explicit, with respect to both goals and methods.

A second dimension of diversity (which is related to values about goals) is that different methods (and theories) are required for different kinds of learning. Instructional theory has overlooked many kinds of learning, such as:

- Character education
- Attitudes and values
- Emotional learning (related to the much publicized EQ—emotional quotient)
- Other areas in the affective domain
- Problem solving
- Other cognitive strategies (higher-order thinking skills)
- Understanding
- Other areas in the cognitive domain
- Motor (physical) skills

Volume 2 will include at least one chapter on each of these kinds of learning.*

Conclusion

In this article, I have reflected on what I think are the most important issues and ideas presented in the previous articles, and raised some other issues I believe are important. There seems to be some consensus that: (1) theory is of crucial importance to practice, (2) we have a long way to go before theory can approach its potential for meeting our needs, (3) theory will never be sufficient for designing instruction of high quality, and (4) new directions are needed for theory to approach its potential contribution.

It is exciting to see these authors and other people helping to figure out what those new directions should be to provide the most help to practitioners. I hope we will see more instructional designers contributing to our design theories, for, as Bill Winn puts it, "For the basic scientist, ... changing theory is the responsibility of the practitioner. It is also the responsibility of the instructional designer...." I want to particularly encourage practitioners to share with the rest of us the design theories you develop from your practice. □

*If you know of a theory that should be included, or if you would like to contribute a chapter to this book, please contact me about it at reigelut@indiana.edu.

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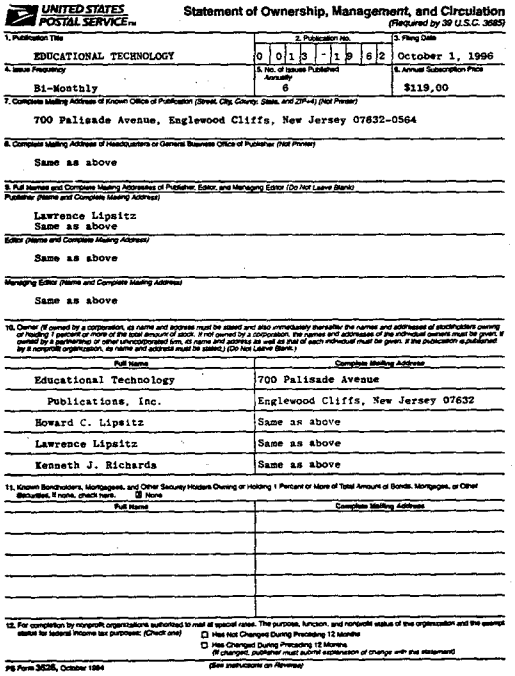

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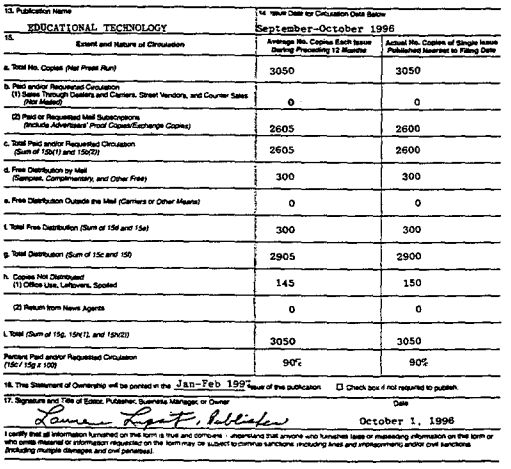

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