SYNTHESIS OF

SELECTED INSTRUCTIONAL DESIGN THEORIES

by

Theodore C. Smith

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Address:	7053 Enright Drive
City, State, Zip:	Citrus Heights, CA 95621
Phone:	(916) 726-4961
E-mail:	tcsmith@surewest.net
Instructor:	Rod Sims
Mentor:	None

Abstract

Numerous instructional design theories and models offer guidance regarding how to better help people learn and develop. Rather than approaching instructional design from an "only theory one is correct" perspective that is common in many scientific fields, each theory or model should be viewed as but tools in a suite of options, addressing cognitive, psychomotor, and affective learning domains. The ever-growing body of instructional design theories challenges knowledge producers to find effective delivery methods and knowledge users to identify, analyze, organize, and assimilate theories and models that they can effectively and efficiently use in real-world settings.

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Introduction

"Instructional design theories offer explicit guidance on how to better help people learn and develop" (Reigeluth, 1999c, p. 5). Numerous instructional design theories and models exist, developed by educational scientists and practitioners. Rather than regarding instructional design (ID) theory from a "one size fits all" perspective, it is best to regard each theory as but one tool in a suite of options, with the goal of the instructor and learner being to select the optimum vehicle that suits the style of individual learner's.

The first section of this paper discusses 20th Century worldviews and educational approaches and introduces the need for a new educational paradigm. The second, third, and fourth sections describe suites of educational theories (covering cognitive, affective and psychomotor domains, respectively) that may be appropriate for use as part of this new paradigm. The fifth section discusses challenges that the profession and individual instructional designers face.

Worldviews and Educational Paradigms

Polkinhorne (1994) notes that scientists typically are bottom-up thinkers—ones who explore the physical world based on what they see and experience. These scientists are often parochial, exploring but a small part in various fields (e.g., astronomy, biology, chemistry, geology, physics) that comprise the universe. Each develops theories that adequately explain what he or she sees, frequently "confining themselves to primarily quantitative questions of matter and motion…" (p. 5). Such approaches yield results that are impersonal, largely repeatable, and might condemn one to a "narrow reductionist conception of reality" (p. 5). Interdisciplinary scientists typically take these individual theories and attempt to work upwards

to collectively develop a common general framework and worldview—one that satisfies the requirements of the many individual theories. Still, this approach might yield an incomplete view because, as Polkinghorne notes, "[the] discarded secondary qualities of human perception may in fact prove to be the primary clues to the construction of an ampler view of the way the world is. Music is more than vibrations in the air" (p. 5).

In contrast to scientists, theologians are instinctively top-down thinkers (Polkinghorne, 1994). They tend to start with a single worldview and attempt to make everything fit. Theologians often using grand generalities, overlooking or contradicting some scientific details which may not fit their view.

In some ways, ID theory and education practice parallel science and theology. First, developers of ID theories (educational scientists) often start by observing details, (a) documenting how people think and learn and (b) identifying methods that do and do not work. In contrast, during the 20th Century, U.S. public schools operated in a "one size fits all" mode. The educational establishment, like the theologians, imposed a single teaching method on the nation. Reigeluth (1999c) states that the 20th Century educational paradigm was based on conformity and compliance. This standardized mode of instruction was compatible with industrial age needs where laborers were separated from managers. In essence, Reigeluth asserts, schools were responsible for sorting learners according to their abilities to learn and perform in a rigid, standardized environment.

In one significant way, however, ID theory and education practice should not parallel science and theology. Those of us who were raised and educated in the 20th Century in essence received a limited science education—typically involving biology, chemistry, physics, and earth science. In these courses we were taught that all these sciences fit and worked together within a

single, interlocking framework. Having received a standardized education, some of us (as evidenced by recent ED 7920 courseroom discussions) tend to perpetuate these views—sometimes, at least initially, trying to fit all educational theories and models together in a single, overarching, standardized model—one that is capable of serving as a new "one size fits all" approach.

However, our 20th Century K-12 education often lacked behavioral science content. True, we received instruction in social sciences (history, government, and world societies), but seldom were we exposed to issues of psychology, dysfunctional traits and behaviors (unless we ourselves were dysfunctional or misbehaved), different learning styles, etc., perhaps because those topics do not fit neatly into a harmonious, unified interlocking model.

Reigeluth (1999c) asserts that the educational paradigm needs to shift to prepare workers for success in the information age—that "we must now focus on learning instead of sorting" (p. 18) so that all learners will succeed. In essence, this is the philosophy underlying the *No Child Left Behind Act of 2001,* of which, as President Bush stated, "When it comes to the education of our children . . . failure is not an option" (U.S. Department of Education, 2001). Instead of emphasizing conformity and compliance, education must shift to a new paradigm of customized instruction that enables all to advance—"a *learning-focused* paradigm " (Reigeluth, 1999c, p. 19).

Overview of Selected Cognitive Instructional Design Theories

Schuman (1996) defines three basic (or foundational) learning theories:

1. Behaviorism—Based on behavioral changes. Focuses on a new behavioral pattern being repeated until it becomes automatic.

2. Cognitivism—Based on the thought process behind the behavior. Changes in behavior are observed, but only as an indicator to what is going on in the learner's head.
3. Constructivism—Based on the premise that we all construct our own perspective of the world, based on individual experiences and schema. Focuses on preparing the learner to problem solve in ambiguous situations (¶ 1).

Reigeluth (1999c) indicates that learning theories describe only "how learning occurs" (p. 12), and not what instructional methods should be employed to trigger learning.

In contrast, Reigeluth asserts that instructional design theories "describe specific events outside the learner that facilitate learning" (p. 13). LaGow (1977) states, "Instructional design theory should be able to explain the sequence used in the design of instruction and provide a basis for criteria to judge the usefulness of tasks that are included in the activity" (p. 3, as cited in Taylor, 2003). "An instructional design model gives structure and meaning to an I.D. problem, enabling the would-be designer to negotiate her design task with a semblance of conscious understanding. Models help us to visualize the problem, to break it down into discrete, manageable units" (Ryder, 2003, ¶ 1).

Reigeluth and Moore (1999) note that the diverse approaches of various instructional design theories and methods makes comparison difficult. They offer a basic framework to aid students in identifying similarities and differences of various cognitive theories (Table 1). Note that Reigeluth and Moore (p. 63) suggest that interactions for learning may also specify whether students interact with tools, information, environment/manipulatives, or other nonhuman resources. Adopting Reigeluth and Moore's approach yields a synthesis presented in Tables 2A, 2B, and 2C.

Table 1

Description of comparison framework

Comparison Point	Description
Type of Learning	What types of learning do the theory and its methods address?
Control of Learning	Who controls the nature of the learning process: the teacher, the student, the instructional designer?
Focus of Learning	Do the learning activities revolve around specific topics, or problems or something else?
Grouping for Learning	How are learners grouped? Do they work individually or with others?
Interactions for Learning	What is the primary nature of interaction: teacher with student, student with student, student with material?
Support for Learning	What kinds and levels of support are given to the learner? What kinds of cognitive support are given by the teacher or the materials? What kinds of resources are available? What kinds of emotional support are given?

Source: Reigeluth and Moore (1999, p. 55)

Many instructional design theories involve student control—meaning that students take charge of their own learning (e.g., deciding what to investigate, determining personal learning goals and objectives—rendering the instructor as more of a facilitator than lecturer and focusing on enabling the student to discover or develop knowledge. Hein (1991) describes this sort of approach as contructionist, referring to the idea that learners construct knowledge for themselves---each learner individually (and socially) constructs meaning---as he or she learns" (¶2). Hein states that constructive learning methods mean that (1) "we have to focus on the learner in thinking about learning (not on the subject/lesson to be taught)" and (2) "There is no knowledge independent of the meaning attributed to experience (constructed) by the learner, or community of learners" (¶2).

Table 2A

Synthesis of selected instructional design theories and models contained in Reigeluth (1999a)

Chapter Number, Theory, and Author(s)	Type of Learning	Control of Learning	Focus of Learning	Grouping for Learning	Interactions for Learning	Support for Learning
4. Multiple approaches to understanding (Gardner, 1999)	Apply generic skills, understand relationships	Teacher	Interdisciplinary; problem oriented, topic oriented, domain specific	Individuals and groups	Teacher-student, student- student, student-material	Cognitive, emotional
5. Teaching and learning for understanding (Perkins and Unger, 1999)	Apply generic skills, understand relationships	Teacher	Topic oriented, domain specific	Group	Primarily teacher with student, some student-student	Cognitive
6. Open learning environments (Hannafin, Land, and Oliver, 1999)	Apply generic skills, understand relationships	Student	Interdisciplinary; problem oriented	Individual	Student-environment/ manipulative	Cognitive
7. Designing for constructivist learning (Mayer, 1999)	Apply generic skills, understand relationships	Student	Topic oriented	Individual	Teacher-student, student-resources	Cognitive
8. Learning by doing (Schank, Berman, and Macpherson, 1999)	Apply generic skills, apply skills, memorize information, understand relationships	Student	Problem oriented; domain specific or interdisciplinary	Individual, team, and group	Student-material, teacher-student, student-student	Cognitive
9. Flexibly adaptive instructional designs (Schwartz and others, 1999)	Apply generic skills, apply skills, memorize information, understand relationships	Student, with teacher and instructional designer	Problem oriented	Individual, team, group	Student-material, student-environment, student-student	Cognitive

Table 2B

Synthesis of selected instructional design theories and models contained in Reigeluth (1999a)

Chapter Number, Theory, and Author(s)	Type of Learning	Control of Learning	Focus of Learning	Grouping for Learning	Interactions for Learning	Support for Learning
10. Designing constructivist learning environments (Jonassen, 1999)	Apply generic skills	Student	Problem oriented	Individual	Student-material, student-teacher	Cognitive, emotional
11. Collaborative problem solving (Nelson, 1999)	Apply generic skills	Instructor and student	Problem oriented	Team	Teacher-student, student-student, student-material	Cognitive, emotional
12. Learning communities in classrooms (Bielaczyc and Collins, 1999)	Apply generic skills	Student	Problem oriented, interdisciplinary	Team	Student-teacher, student-student, student-environment	Cognitive, emotional
13. Classroom instruction (Corno and Randi, 1999)	Apply generic skills	Student, teacher, instructional designer	Problem oriented	Individual, team	Student-teacher, student material	Cognitive
14. Learning environments (Pogrow, 1999)	Apply generic skills	Instructional designer	Problem oriented, domain specific	Team	Student-material, student teacher	Cognitive
15. Teaching general methods of thinking (Landa, 1999)	Apply generic skills	Instructional designer, teacher	Not specified	Not specified	Student-teacher	Cognitive

Table 2C

Synthesis of selected instructional design theories and models contained in Reigeluth (1999a)

Chapter Number, Theory, and Author(s)	Type of Learning	Control of Learning	Focus of Learning	Grouping for Learning	Interactions for Learning	Support for Learning
16. Integrated thematic instruction (Kovalik with McGeehan, 1999)	Apply generic skills, memorize information, understand relationships	Teacher	Interdisciplinary, problem oriented	Team	Teacher-student, student-student, student-material	Emotional, cognitive
17. Instructional transaction theory (Merrill, 1999)	Apply skills	Instructional designer, student	Topic oriented, domain specific	Individual	Student-environment/ manipulative	Cognitive, emotional
18. The elaboration theory (Reigeluth, 1999c)	Apply skills, understand relationships	Teacher	Interdisciplinary, topic oriented, domain specific	Individual	Not specified	Cognitive

Compiled by T. C. Smith. Some data from Reigeluth and Moore (1999, pp. 57-65) and modified from colleagues in ED 7620.

Of the cognitive models described in Reigeluth (1999a), only one—Pogrow's (1977)—focuses on accelerating the learning of disadvantaged students; the other theories in Reigeluth seem more suited for typical to advanced learners. [However, by no means are the theories described in Reigeluth (1999a) the only instructional design theories. For example, Kearsley (2003) summarizes almost 50 additional instructional design theories.]

Many of instructional design theories focus on applying generic skills, understanding relationships, and empowering and motivating students. Few seem to focus on rote memorization of information. [Perhaps this is a reflection of our reliance on computers and calculators for mathematical operations—gone are the days when students had to memorize sine tables and other complex mathematical information.]

Instructional Design Theories for Affective Development

Reigeluth (1999a) also includes theories that address affective development. Those theories focus on social, emotional, character (moral, ethical, and motivational), attitudinal, and spiritual development. Lewis, Watson, and Schaps (1999) suggest that an environment where "all [students] feel like valued community members" (p. 515) helps to enable students develop qualities of intellect, attitude, and character. Stone-McCown and McCormick (1999) state that emotional development "is an essential foundation for and component of cognitive development" (p. 489).

While most of the instructional design theories for affective development are specifically directed towards children (e.g., Lewis, Watson, and Schaps, 1999; Lickona, 1999; Moore, 1999; and Stone-McCown and McCormick). However, several of these theories probably could be adapted to a higher education institution, especially a religious college like Patten University. For example, *Educating for social, ethical, and intellectual development* (Lewis, Watson, and

Schaps, 1999) fits neatly within Patten's distictives, as do spiritual development (Moore, 1999) and character education (Lickona, 1999). There may even be opportunities to address attitudinal instruction (Kamradt and Kamradt, 1999), especially in the context of helping pastors learn how to help parishioners deal with attitudinal issues.

Psychomotor Theory

Instructional design theories are not limited to the cognitive and affective aspects of learning. Romiszowski (1999) addresses learned physical skills in stable (closed) and ever-changing (open) environments. His psychomotor theory includes a mix of imparting information to learners (e.g., verbal or written descriptions of action sequences) and performance activities (or physical practice drills).

Unlike cognitive and affective domains, where its sometimes difficult to identify whether learning has occurred and/or what activities caused the learning to occur, the actions and results (physical products) are easier to document in psychomotor learning As a result, psychomotor theory contains a fairly complete set of situations and learning objectives and recommends specific techniques for each that are intended to result in learning the physical skill. Thus, Romizowski's comprehensive approach to psychomotor theory might serve as a completeness model for other theories.

Current and Future Challenges

In summarizing the various theories that are presented in Reigeluth (1999a), Schnelbecker (1999) notes that authors of the various theories were careful to restrict the scope of their theories. Snelbecker states that the body of literature related to instructional design is growing, presenting the profession with the challenge of making sense of all of this material. Not

only does the profession need ways to know that the various materials exist, but the profession also needs means and methods that help knowledge producers and knowledge users better understand and use these materials. Perhaps resources like Kearsley's (2003) are a partial answer, although as of May 2003, his site did not cite the theories contained in Reigeluth (1999a). Perhaps, similar to recent findings in applied natural sciences (Smith and McKamey, 2000), knowledge producers—researchers who want their findings to be effectively used by society—bear significant responsibility for effective delivery to potential users. Smith and McKamey document that, absent effective delivery and follow-up, research products are often ignored. The consequences of these findings are that entities that fund research increasingly are only funding efforts that have significant knowledge delivery components.

We, as individual instructional designers, also face challenges. As suggested in the discussion of affective domain theories and Patten University above, sometimes we, like the profession as a whole, need to extend and adapt existing theories for our own uses. We also need to expand our horizons—it is often too easy to simply read about theories and methods with which we are already familiar. Take, for example, the ED 7620 course in which my colleagues and I are currently enrolled. When given an assignment to contribute three analyses of instructional design theories, many of us chose to analyze theories that we are currently using or with which are already familiar (Table 3 and Figure 1). As a result, the content of the course was similarly skewed; three theories were analyzed by only one student each and three more were not presented at all. While it is certainly possible that the bulk of our course discussion was focused on the most useful or best theories, the pattern presented in Table 3 suggests that the volume of new theories coupled with our current workload demands may slow the identification, spread and application of useful new theories.

Table 3

Number of students who reviewed and summarized assigned instructional design theories contained in Reigeluth (1999a) during ED7620 (Spring 2003 session) Unit 4

Chapter Number, Theory, and Author(s)	Approximate Number of Students Who Posted Analyses
4. Multiple approaches to understanding (Gardner, 1999)	5
5. Teaching and learning for understanding (Perkins and Unger, 1999)	5
6. Open learning environments (Hannafin, Land, and Oliver, 1999)	1
7. Designing for constructivist learning (Mayer, 1999)	3
8. Learning by doing (Schank, Berman, and Macpherson, 1999)	9
9. Flexibly adaptive instructional designs (Schwartz and others, 1999)	1
10. Designing constructivist learning environments (Jonassen, 1999)	4
11. Collaborative problem solving (Nelson, 1999)	5
12. Learning communities in classrooms (Bielaczyc and Collins, 1999)	0
13. Classroom instruction (Corno and Randi, 1999)	0
14. Learning environments (Pogrow, 1999)	0
15. Teaching general methods of thinking (Landa, 1999)	1
16. Integrated thematic instruction (Kovalik with McGeehan, 1999)	3
17. Instructional transaction theory (Merrill, 1999)	4
18. The elaboration theory (Reigeluth, 1999c)	3
Total Posts	44

Notes: There are 17 students enrolled in the course. Fifteen students were directed to analyze three chapters each, of his or her own choosing. One student instead analyzed Chapter 21, which not part of this assignment, reducing the total to 44 instead of 45. Compiled by T. Smith.

Summary

Numerous instructional design theories and models individually should be regarded as tool in a suite of options, with the goal of the instructor and learner being to select the optimum vehicle that enables effective and efficient learning. Most of these theories and models have been developed by knowledge producers for fairly narrow application. However, knowledge users

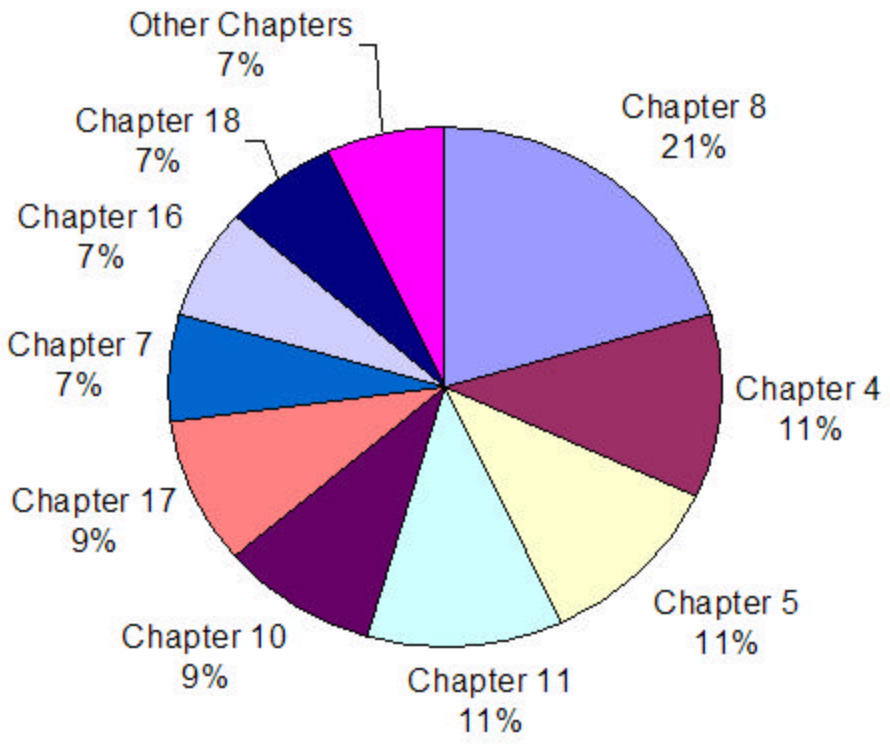

Figure 1

Percent of ED 7620 students who analyzed various theories in Reigeluth (1999a)

may be able to carefully adapt and extend these theories and models for use in real-world settings.

The ever-growing body of instructional design literature presents the profession and individual designers with an ongoing challenge to identify, analyze, organize, assimilate and effectively and efficiently use appropriate theories and models in real-world settings.

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