Designing Direct Instruction[1]

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This chapter provides an overview of research on a generic approach to direct instruction as well as a more specific approach, labeled scripted lessons. It is emphasized that this approach to providing quality instruction works best when students are placed in a curriculum based on an assessment of prerequisites and when enough time is provided for mastery of content knowledge and skills.

Defining quality instruction has been a goal of researchers from the beginning of formal schooling. Over the last forty years data have accumulated showing that students who receive high quality instruction demonstrate more successful school learning than students who do not (Joyce, Weil, & Calhoun, 2003). While most individuals value student learning, a major problem arises when quality instruction is discussed outside the context of specific educational objectives or desired educational outcomes. Gardner (1999a) makes this point quite emphatically:

> I do not think it is possible to talk intelligibly about how to teach unless one has taken a stand on what one should teach and why. (p. 72)

Hummel and Huitt (1994) introduced the acronym WYMIWYG (What You Measure Is What You Get) to make this same point. Curriculum objectives, the form and instrumentation of assessment, and the standards used for evaluation come first; discussion of quality instruction should follow. Therefore, an analysis of the design of instruction must give consideration to the product of instruction.

While there is a national discussion regarding desired outcomes for successful adulthood in the twenty-first century (e.g., Huitt, 1997; Partnership for 21st Century Skills, 2003; Secretary's Commission on Achieving Necessary Skills, 1991), at this time the most widely used measures of student learning are standardized tests of basic skills. When these outcome measures are used, direct or explicit instruction models most often produce the highest student scores (Rosenshine, 1995) and, therefore, should be considered a primary option teachers consider when designing instruction.

This chapter provides an overview of the direct instruction model and is divided into three sections: (a) an introduction to general research-based design attributes of quality instruction; (b) a description of a general model of direct instruction a teacher could utilize to create teacher constructed direct instruction lessons, and (c) an explanation of a specific direct instruction curriculum available as a commercial program (e.g., Englemann, 1999) and used for

[1] This is a slightly edited version of the chapter as it appears in the book. There were small editorial changes made, a chapter outline was included, and editorial notes were inserted.

the development of scripted lesson plans (Gunter, Venn, & Hummel, 2001). Thus, the chapter begins with a description of the attributes which typify quality instruction, and then defines quality instruction from both teacher constructed and commercially available direct instruction lessons.

Designing Instruction

The design of instruction has critical implications for the why, what, and how of formal schooling. Given the importance of student learning and achievement, instructional design requires serious analysis, consideration, and reflection. Reigeluth (1999) says that instructional-design theories should provide practitioners with clear information on how the intended audience learns and develops. Perkins (1992) identifies 4 factors a good instructional theory should include: clarity, practice, feedback, and motivation. First, the content should be clear to the learners. This "clarity" should include what is to be learned, how well it must be mastered, and the specific performance(s) the learner must demonstrate. Clear objectives, such as those specified by Mager (1997) and Gronlund (2003), are critical to both the designer's and learner's success in achieving clarity. Second, learners must have numerous opportunities to practice the skills being learned, and third, learners should receive corrective feedback. Finally, learners must experience reinforcement for effort, progress, and success. Such motivation can be either intrinsic to the task "because they are very interesting and engaging in themselves" or extrinsic to the situation "because they feed into other achievements that concern the learner" (Perkins, 1992, p. 45).

Reigeluth (1999) takes the position that instructional-design theories should (a) improve learning and development; (b) inform the practitioner which methods of instruction, and there may be competing-or-complementary ones, to employ to achieve specific outcomes in specific situations (i.e., an instructional method *designed* to prepare students to score high on an achievement test may not be the best method to help them run and evaluate an experiment); and (c) make sure the methods identified only increase the likelihood (though to high levels) that the outcomes will occur rather than guaranteeing it for all learners and situations.

Evaluating Models of Instruction

Reigeluth (1999) identifies 3 levels of analysis to evaluate how well a method works in achieving instructional outcomes: effectiveness, efficiency, and appeal. Effectiveness requires that appropriate indicators of learning (such as specific levels of achievement and fluency) be identified to objectively measure the learning outcomes. Efficiency requires an optimal use of resources such as time and money to obtain a desired result. Level of appeal relates to the degree to which learners enjoy the instruction. Some educators, especially those espousing a child-centered approach, suggest this criterion should take precedence over the other two. However, this is problematic in that the academically relevant content public schools must cover as part of their charge usually requires copious time and effort on the part of students. As a result, *immediate* satisfaction and enjoyment of the instruction can be elusive. However, if several methods produce equally effective and efficient results, one should employ the one learners like the most. For example, Martin (1999) found that individual written exercises produced similar levels of effectiveness and efficiency as did analogous cooperative learning activities, but the latter were overwhelmingly preferred by the students. In such cases one should opt to use the instructional methods students prefer.

Attributes of Quality Instruction

Classroom research in the 1950s and 1960s, supported by newly developed techniques for applying systematic observation to classroom practices (Flanders, 1970) and reviewed by Carroll (1963), led to the development of new ideas about school learning. The types of studies using this approach came to be known as process-product studies (Gage, 1978, 1994) and findings were summarized in a number of models of effective classroom practice (Cruickshank, 1985; Proctor, 1984; Squires, Huitt, & Segars, 1983).

Logically, a primary purpose of providing quality instruction is for students to be successful on academic tasks (Darling-Hammond, 2000). However, it should be emphasized that most models of quality instruction, in addition to the specification of events of instruction, incorporate the additional teaching activities of planning and management. An important instructional planning element is that any model of instruction must be implemented in combination with a curriculum that is aligned to objectives measured on an evaluation of achievement (Cohen, 1995). Brady, Clinton, Sweeney, Peterson, and Poynor (1977), as well as Cooley and Leinhart (1980), reported that, on average, objectives covered in textbooks and objectives covered by standardized tests overlap between 40% and 60%. Taking the time to make sure content overlap occurs is vital, as alignment of a school district's curriculum with objectives assessed by standardized tests can explain up to two-thirds of variance among scores (Wishnick, as cited in Cohen, 1995). Additionally, the curriculum should be constructed using task analyses that identify the prerequisites for all learning objectives (Bloom, 1971) and provide opportunities for students to revisit previously covered objectives as they move through the curriculum (called a spiral curriculum, Bruner, 1990).

Planning and implementing a long-term solution-oriented classroom management program is another effective classroom practice and one of the most effective means of increasing students' time-on-task or engaged time, an important predictor of students' academic achievement (Berliner, 1990; Brophy, 1983; Brophy & Good, 1986).

Combined, these three measures of student classroom behavior (student success, content overlap, and time-on-task) result in the measure called academic learning time (ALT), defined as the amount of time students are successfully involved with important and meaningful content, especially that which will be tested through outside audits of the schooling process, such as standardized achievement tests (Berliner, 1990; Squires et al., 1983). It is the acquisition of ALT that should be the central focus of teachers and students during the relatively short period they spend in the formal learning environment.

A number of specific attributes of quality instruction were discovered using the process-product research approach. One general condition, identified by Carroll (1963) and elaborated by Bloom (1971, 1976) is that students have varying capacities for learning academic material and come to the learning task with different levels of prerequisite skills. Therefore, additional learning time must be provided if all students are expected to demonstrate mastery on curriculum objectives (Guskey & Gates, 1986; Guskey & Pigott, 1988) and instruction must proceed in an manner adapted to the background and skills of students (Walberg, 1999).

In general, direct instruction models advocate that essential content should be exposed to students via an active presentation of information (Rosenshine, 1995). Bloom (1971) stated that teachers should provide a clear organization of the presentation with a step-by-step progression from subtopic to subtopic based on task analyses. Other research-based attributes of direct instruction include: (a) pretesting or prompting of relevant knowledge (Block, 1971; Bloom,

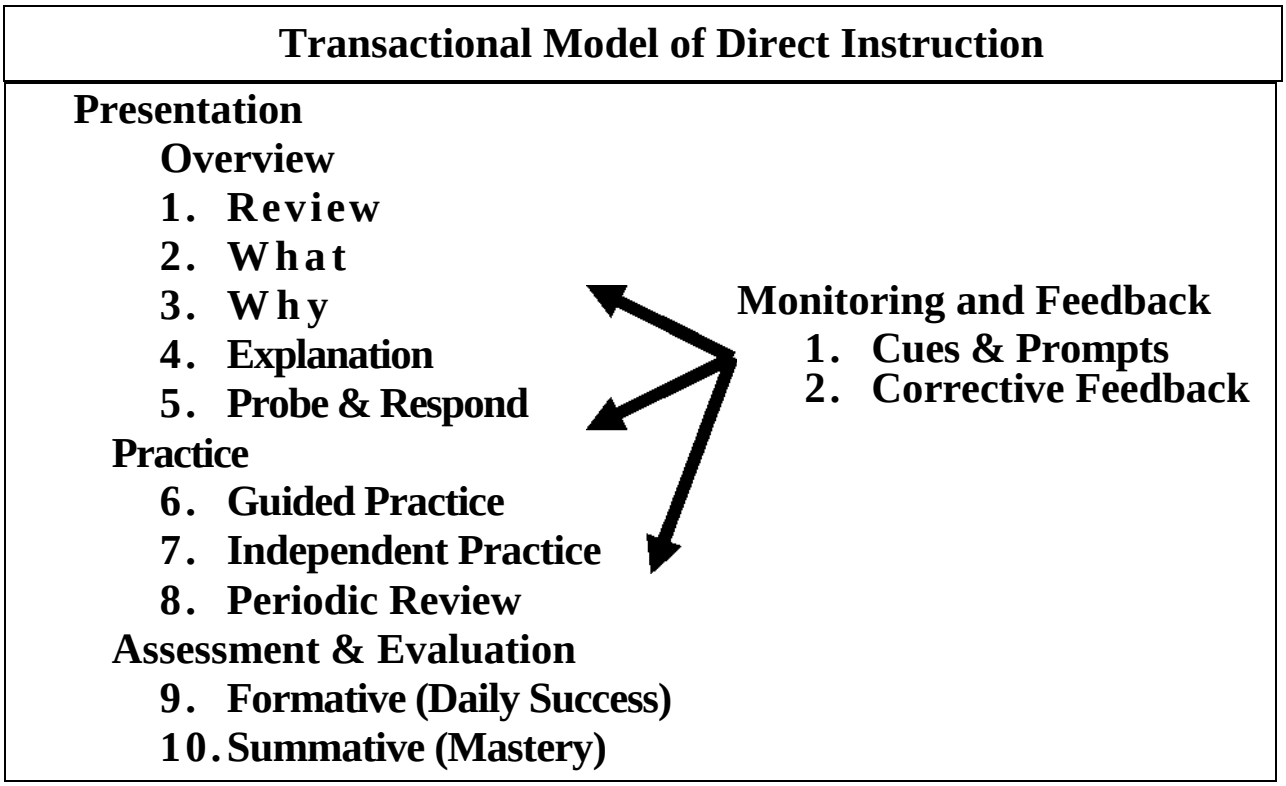
1971), (b) more teacher-directed instruction (> 50%) and less seatwork (< 50%) (Fisher et al, 1978), (c) more student-teacher interaction (Walberg, 1991), (d) the use of many examples, visual prompts, and demonstrations (to mediate between concrete and abstract concepts (Gage & Berliner, 1998), and (e) a constant assessment of student understanding before, during and after the lesson (Brophy & Good, 1986).

Several popular models of instruction were developed using these research findings (e.g., Gagne & Briggs, 1979; Good & Grouws, 1979; Hunter, 1982; Rosenshine & Stevens, 1986; Slavin, 1986). Rosenshine (1995) provided an updated version of this approach and showed how the latest research from cognitive psychology could be incorporated in a direct instruction model.

The Events of a General Model of Direct or Explicit Instruction

The following section of the chapter presents the specific events of instruction advocated in a general model of direct or explicit instruction, a transactional model that emphasizes teacher/student interaction at each point in the lesson (Huitt, 1996). This model proposes four categories of events of instruction: (a) presentation, (b) practice, (c) assessment and evaluation, and (d) monitoring and feedback. Presentation, practice, and assessment/evaluation are done in a somewhat linear fashion, with monitoring and feedback occurring throughout the lesson (see Figure 1). Within each of the four major categories there are important instructional events that increase the likelihood that the learner will successfully learn new concepts and skills. Again, it must be emphasized that this instructional model works best when implemented within an aligned curriculum into which students have been placed based on a pretest of prerequisite skills.

Figure 1. Transactional Model of Direct Instruction



Presentation

There are five important instructional events that should occur during the presentation phase of direct instruction: (1) review of previous material and/or prerequisite skills, (2) a statement of the specific knowledge or skills to be learned, (3) a statement or experience that provides students with reason or explanation of why these particular objectives are important, (4) a clear, active explanation of the knowledge or skills to be learned, and (5) multiple opportunities for students to demonstrate their initial understandings in response to teacher probes.

An important instructional implication from cognitive psychology is that learning is made more meaningful if the presentation is preceded by an advance organizer (Ausubel, 1960). The first three events of the general model of direct instruction discussed in this chapter do just that; they provide a rich structure or framework within which instruction will take place. While the three events are listed in order, there is no logical or empirical evidence that suggests this particular order. Rather there are legitimate reasons why an instructional designer or teacher might want to switch the order. However, it is vital that these three events occur before the presentation of new concepts begins.

In the first event, review, teachers and students go over previously learned knowledge or skills that are relevant or prerequisite to the new learning that is to take place. Teachers could have students check homework or discuss difficult material from the previous day's lesson (Walberg, 1999). Teachers could also create an activity that has students utilize concepts and skills that have been previously learned. It is important that students activate prior knowledge so that they can more easily establish links to new information (called elaboration by information processing theorists such as Craik & Lockhart, 1972).

In the second event, teachers describe what is to be learned in this lesson. Teachers state the objectives and how the student is to be held accountable for the learning activity. As previously stated, the work of Mager (1997) and Gronlund (2003) can guide the writing and presentation of learning objectives. Students should be informed as explicitly as possible what they should be able to do at the end of the learning process. There are two types of objectives teachers can write at this point. The first are learning or activity objectives. These state what the students will be doing in the present lesson and serve as an organizer for the day's activities. They are also statements about how the teacher will monitor student performance for formative evaluation purposes. The second are terminal objectives stating what the student will be able to demonstrate at the end of instruction on summative assessments. There may be several lessons that will prepare students for the knowledge or skills that will be summatively evaluated and students should be informed of how multiple lessons tie together.

In the third event, teachers describe why a particular objective is important for students to master. The teacher might have students engage in an activity that could be done more efficiently once the new content or skills have been mastered. The teacher might also lead a discussion of tasks performed in other classes or subject areas that are relevant to the new learning. Ultimately, it is important that students have a personal reason to be engaged in the learning process. McCarthy (2000) stated that as many as 40% of students in normal K-12 classrooms have a learning style that demands a satisfactory answer to "Why should I be involved" before they will engage in a learning task. These students are overrepresented in remedial and special education classes because traditional instruction does not successfully address this issue in a personally meaningful way.

The fourth event is the active, careful explanation to students of the content or skill to be learned. An important principle guiding this event is that the teacher should move from sub-topic to sub-topic in an efficient manner, introducing new material in small portions and connecting each new sub-topic to the previous one (Bloom, 1971; Walberg, 1999). One of the most important considerations is to structure the presentation such that the organization is clear and obvious to students. Researchers have identified a number of organizations that might be used:

1. component relationships – the lesson could be organized from parts to a whole (inductive) or from whole to parts (deductive). For example, this discussion of direct instruction could be organized from a discussion of specific activities that should be incorporated into a lesson or a description of the lesson with ever increasing detail regarding the parts.
2. relevance relationships – the lesson could be organized based on meaningful associations or possible consequences. For example, a discussion of quality instruction might first present a discussion of desired outcomes (e.g., basic skills, emotional development, social skills) and then discuss different methods of instruction that would address these outcomes.
3. sequential relationships – the lesson could be organized in terms of a step-by-step sequence. For example, the explanation of a direct instruction lesson could be organized in terms of the serial implementation of a set of events of instruction.
4. transitional relationships – the lesson could be organized in terms of the movement from one phase or stage to another; these changes imply a qualitative change and are not merely steps in a sequence. Presentations on Piaget's stages of cognitive development or Erikson's stages of socioemotional development would be examples of this organization.

Teachers should use many examples, visual aids (e.g., concept maps and flow charts), and demonstrations in their presentation to enhance the effectiveness and efficiency of instruction (Gage & Berliner, 1998; Walberg, 1999).

In the fifth event, teachers probe the students regarding their initial understandings. These should be quick, short explorations of student knowledge or skills that inform the teacher if students are acquiring the concepts being presented. Two important issues related to questioning should be considered. First, Gage and Berliner (1998) suggested that teachers should ask more lower-level (knowledge and comprehension) questions (80 to 90%) in elementary grades. Teachers in the middle and upper grades should ask relatively more higher-level questions that require students to actively process information (Walberg, 1987). Second, teachers need to make instructionally effective use of wait-time, defined as the interval between a teacher probe and student response (Wait-time I) or the interval between the student response and the teacher response (Wait-time II). Rowe (1974a, 1974b) found that increasing either led to increased achievement with increasing both having a compound effect. Moreover, Fagan, Hassler, and Szabo (1981) found that using both higher-order questions and increased wait time had greater impact than using either separately.

Practice

As shown in Figure 1, there are three events of instruction in the practice phase of a direct instruction approach to learning: (6) guided practice under the teacher's direct and immediate supervision, (7) independent practice where the student is working on his or her own, and (8) periodic review (often incorporated daily in guided and independent practice) whereby students are utilizing previously learned content or skills.

In the sixth event, students practice the newly learned knowledge or skills under the teacher's direct supervision (Walberg, 1999). Students could engage in such activities as practicing reading to each other in groups, solving a few math problems, writing a short outline of important points covered in the teacher's presentation, or comparing and contrasting two historical events or two species of animals. Students could work by themselves, in pairs, or small groups. At this point in the lesson, the teacher must actively monitor student activity while providing immediate feedback. At the end of this event, teachers should have rather precise information regarding each student's knowledge or skill with respect to the lesson objective(s).

In the seventh event, students practice the new concepts independently. This may be done in the classroom or at home. While there has been some research that homework is relatively less important for elementary students (Cooper, Jackson, Nye, & Lindsay, 2001), the vast majority of research supports the positive effects of homework for middle grades and high school students (Walberg, 2003; Walberg, Paschal, & Weinstein, 1985). Most importantly, homework must be completed and graded if it is to be effective (Cooper, Lindsay, Nye, & Greathouse, 1998; Walberg, 1999). It seems quite obvious that if the instructional day can be increased, thereby giving students more engaged time (Berliner, 1990), then student achievement will increase. However, if students do not have the supportive home environment that leads to successful homework completion, the school needs to provide additional time after school to complete homework in a supervised environment. Otherwise, assigning homework can lead to inequities in content mastery due to circumstances beyond the students' or teachers' control.

In the eighth event, which can be incorporated into teacher probes, as well as guided and independent practice, students connect with and practice material they have already learned. Research done more than 60 years ago detailed the benefits of distributed practice (Hull, 1943). In fact, Saxon (1982) made this principle one of the hallmarks of his successful approach to mathematics instruction (Klingele & Reed, 1984). This is one event, along with providing an overview before beginning an explanation, that is often omitted. Teachers would be well served, when designing instruction, to make sure students have opportunities to revisit material learned a week, a month, or even a year previously. While cognitive research has shown that once material is in long-term memory it is there permanently (Atkinson & Shiffrin, 1968), students need practice retrieving that information and using it appropriately. This is an excellent place in the lesson to use cooperative learning techniques (Johnson & Johnson, 1998; Slavin, 1994). Students can be assigned tasks or problems that incorporate both recently and previously covered content and skills. Students should have to remember previous material and make decisions as to its appropriate use for a particular problem or situation.

Assessment and Evaluation

There are two instructional events in the assessment and evaluation phase of the direct instruction model (see Figure 1): (9) collecting data on a daily basis to make judgments of

student success, and (10) collecting data on longer intervals such as weekly, biweekly, monthly, etc.

In the ninth event, teachers make formative evaluation decisions about students on a daily basis to determine if they are making progress. Data from the previous events of probing and responding, guided and independent practice, and periodic review activities might be used. Alternately, teachers may decide to give a pop quiz to gather additional information if uncertain about the learning of the group or of particular individuals. The primary function of this evaluation process is to make plans for additional teaching on the topic, if necessary. Walberg (1999) asserts that additional teaching should occur when students perform at less than a 90% level during guided and independent practice exercises.

In the tenth event, teachers gather summative assessment data to see if students have mastered the concepts. This usually is in the form of unit tests or projects covering material from a week or two of instruction. Other types of summative evaluation may include semester or annual exams. It is important that summative evaluations match the content, form, and standards of outside audits of classroom learning. Teachers should know the expectations of standardized tests, the requirements of any related courses students might take in the future, expectations of learning requirements at the next level of schooling, requirements for future employment, etc. Not every summative evaluation must take all of these into consideration, but students and parents have every right to expect that summative evaluations of students' classroom performance relate to judgments made by others.

Monitoring and Feedback

There are two important instructional events that should occur throughout the lesson on an "as needed" basis (see Figure 1): (11) providing cues and prompts, and (12) providing corrective feedback and reinforcement.

In event eleven, cues and prompts, teachers review previous material, ask questions or probes, or have students engage in guided practice. The use of cues to hint at important information or indicate lesson transitions and the use of prompts when having students demonstrate the initial understandings or during guided practice are important instructional activities (Doenau, 1987). When a student is in what Vygotsky (1978) calls the Zone of Proximal Development, the student will sometimes need a cue or prompt in order to be able to recall the required information or demonstrate the desired skill. However, when no amount of prompting evokes the desired response, further instruction is called for. This assistance or further instruction should take place through a process of scaffolding whereby the teacher models the learning task or activity and then carefully and systematically relinquishes more and more responsibility to the student to perform it (Moll, 1992).

Finally, the twelfth event, providing corrective feedback and reinforcement, is done whenever the teacher has made an assessment of student learning at any point in the lesson. Walberg (1986), in his meta-analysis of research on teaching, found that these two activities showed the strongest relationship to student achievement of any of the single teacher actions studied. Feedback should be provided for both correct and incorrect responses. An important principle is that students should not only hear or see the correct answers; they should also know why a particular answer is correct or incorrect. For example, when conducting probes, the teacher could ask a student a question and then ask another student if the first student's answer was correct or incorrect and why. The teacher could do the same type of activity when reviewing

homework or other independent practice activities. Additionally, when going over a multiple choice test, the teacher could select questions with which many students have difficulty and go over each of the possible answers, having students tell her whether that answer is correct or incorrect and why. Dihoff, Brosvic, Epstein, and Cook (2004) showed that immediate feedback is superior to delayed feedback and the teacher should strive to provide feedback as quickly as possible.

The relationship of reinforcement during instruction to academic achievement has been one of the most consistent findings in process-product research (Brophy & Good, 1986; Rosenshine, 1995; Walberg & Paik, 2000). The most common form of such reinforcement is teacher attention: a nod, a smile, or a quick comment. Cheery notes on the assignment or stickers can also be used effectively. Making a practice of sending a positive note home to parents or caregivers for at least one student in each subject area or class period is an excellent way to provide reinforcement for quality work.

In summary, a general model of direct or explicit instruction has teachers actively present new content or skills to students, covering small amounts of material in an organized, step-by-step manner, having them practice that and provide corrective feedback and reinforcement continuously throughout the lesson. Summative evaluations match the content, form, and standards of those who will audit classroom learning, thereby facilitating the student's movement from the classroom to successful adulthood.

Direct Instruction and Scripted Lessons

In the previous section of this chapter, the events or components of the general model of direct instruction were presented. The following section describes a scripted lesson approach to designing instruction. The focus is on a set of commercially available programs employing standardized scripted lessons and marketed by SRA using the term Direct Instruction (DI). This approach can also be used by instructional designers to develop lessons not available in the commercial materials.

DI has been studied and used in public schools for almost 50 years. Public Law 90-92 authorized Project Follow Through to evaluate the effectiveness of 9 models of instruction on measures of three dimensions: academic basic skills, cognition, and affect (Stallings & Kaskowitz, 1974). Of the 9 models studied, the DI model produced the highest average performance of any program in all three dimensions (Watkins, 1988). While all of the programs were originally developed as approaches to help predominately impoverished children who were not academically successful in traditional public school programs, DI also works effectively and efficiently with students who come from average and above average income groups.

Advocates of the commercially available DI programs go to great lengths to distinguish them from teacher-made direct instruction lessons using one of the generic models discussed previously and instructional methods based on learning theory (Kozloff, 2003, p. 15). A major reason is because purchasable DI materials have been subjected to rigorous standardization and field testing that teacher-made materials have not undergone. This standardization of curriculum, when faithfully implemented, has a demonstrated impact on student learning as measured by standardized tests of basic skills beyond that attributable to implementation of one of the more generic models (Englemann, 2004).

A critical feature of DI is its explicitness, reducing the guesswork required on the part of the student as to what is expected to demonstrate mastery. Too often curricular materials and

instruction require the student to *figure-out* what is important. A second feature is that *all* students are expected to learn to a mastery level; a high degree of student success helps raise students' self-efficacy and, indirectly, improve the students' satisfaction with their schooling.

According to Hempenstall (2001), DI shares many features with both behavioral instruction and other forms of direct instruction. This view is supported by Gersten, Taylor, and Graves (1999) who state that DI is based on empirically-established instructional methods including modeling, high rates of student interactions, and a high level of feedback (both corrective and motivational). Gersten et al. (1999) identify 5 core features of DI: "explicit frameworks and problem solving strategies, teaching through examples, attention to relevant curriculum details, effective teaching practices, and the provision of relevant background knowledge" (p. 89). Instructional designers can supplement DI materials by adding additional components deemed necessary for a specific learning objective.

DI materials (and training for teachers on how to correctly implement the materials and monitor students' progress) are available for pre-kindergarten through sixth grade and are marketed by SRA, a division of McGraw-Hill (see http://www.sra4kids.com/). Since the mid-1980s DI materials have responded to national calls for educational reform by revising the materials in all subjects to reflect *big* ideas, defined as:

> ...highly selected concepts, principles, rules, strategies, or heuristics that facilitate the most efficient and broadest acquisition of knowledge. Big ideas serve to link several different little ideas together within a domain such as science, reading, math, or social studies. They are the keys that unlock a content area for a broad range of diverse learners and are best demonstrated through examples instead of definitions. (Kame'enui, Carnine, Dixon, Simmons, & Coyne, 2002, p. 9).

Characteristics of DI (Scripted Lessons)

The characteristics of DI programs appear deceptively simple: Students are grouped in each subject based on how they are performing in the subject (often standardized achievement tests are employed to initially set up the groups); materials, assessments, and teacher presentations are standardized; mastery is required; and generalization of concepts and skills to other areas is emphasized.

Grouping. Historically, ability grouping or tracking has been viewed negatively by educators. As Slavin's (1997) review of ability grouping outcomes suggests, the way ability grouping has been implemented traditionally in the United States has been especially problematic for lower achieving students. He cites several reasons for this. First, students are placed into *tracks* based on their performance on norm-referenced standardized tests (often tests covering content not specifically taught) rather than their actual performance in the subject using a criterion-based test. Once a norm-referenced placement is made, movement across tracks is severely restricted. Students in lower groupings often receive poorer instruction and typically have few positive role models to emulate, are stigmatized within their cohort, and generally do not develop high academic self-concepts. Low-tracked students rarely use texts and other materials that are appropriate to their entry-level skills, and the achievement gap between lower-performing and average students increases each year. As a result, many educators believe that tracking/ability grouping, itself, is the problem.

Other reviews on the effects of tracking (Grossen, 1996; Kulik & Kulik, 1987), however, suggest that tracking, *per se*, is not the problem; rather it is the way in which tracking is implemented. When students are placed in groups based on criterion-referenced assessments of achievement in hierarchically organized subjects such as math and reading (where mastery of early topics is a requirement for success on later topics), instructional decisions are made differently. Materials are used that are appropriate for the students' background skills and knowledge, they receive instruction that is both effective and designed to accelerate their learning to catch up with their peers (Carnine, 1988), and administratively difficult regrouping decisions are made frequently (Engelmann, 1999).

Standardization. Compared to other methods of effective instruction, DI is the only one in which the materials, teacher-led instruction, corrections, and assessments are standardized so thoroughly, that a student, or DI teacher, from one part of the country could step into the same DI class in another part of the country without missing a beat. The developers of DI materials first decide on the outcomes that a particular program should produce. These outcomes are for all students in the program, not just some. Next, materials, including scripts the teachers are to follow exactly, are developed, field tested, and refined until they produce the outcomes for all students that have been previously specified. This meticulous attention to detail (following scripts, delivering probes for choral and/or individual student responses, specific procedures for corrections, and frequently monitoring students' performance) coupled with high mastery requirements all work together to produce high levels of achievement and self-concept that generalize (Watkins, 1988).

To become a good DI teacher initially requires one to be trained in the "do's" and "don'ts" of a specific program (e.g., *Connecting Math Concepts*), and receive regular "coaching" where an external or internal consultant works directly with the DI teacher while teaching the lesson. The original training, usually done by SRA staff, provides instruction on how the DI program is set up, how to follow the script with fidelity using appropriate signals, and how to correct mistakes. Follow-up coaching is designed to ensure that the DI teacher becomes fluent in these areas and to maintain the integrity of the lessons (Hummel, Wiley, Huitt, Roesch, & Richardson, 2004). The idea of "having to learn how to use and teach DI programs" is extremely difficult for many practicing teachers and is a source of teacher turnover when schools first implement commercial DI programs (Rosenshine, 2002, p. 280), but is necessary if all students are to master the program's outcomes.

Mastery. DI programs reflect a "bottom-up" philosophy in that outcome behaviors are first identified and then aligned with national and state curricular standards. Next, outcomes are thoroughly "task analyzed." This involves breaking the complex skill/behavior/concept specified in the outcome into its component parts so that every student in a particular track has the background skills and knowledge to learn the new skills and content presented. Mastery of one lesson provides the students with the requisite skills to master the next, etc.

> A program design that supports mastery does not present great amounts of new information and skill training in each lesson. Rather, work is distributed so new parts in a lesson account for only 10-15 percent of the total lesson. The rest of the lesson firms and reviews materials and skills presented earlier in the program. The program assumes that nothing is taught in one lesson. Instead, new concepts and skills are presented in two or three consecutive lessons to provide students with enough exposure to new material that they are able to use it in applications. So a lesson presents material that is new today;

> material that is being firmed, having been presented in the last two or three lessons; and material that was presented even earlier in the sequence and is assumed to be thoroughly mastered. This material often takes the form of problems or applications that require earlier-taught knowledge. (Engelmann, 1999, p. 2)

Conceptually, one can view the content of commercially-available DI programs and, to a lesser extent, teacher-made scripted lessons as a stairway (Engelmann, 1999). Each step of the stairway presents new content and skills for which the student already has the pre-requisites. The teacher directs the learning activities associated with that level and students acquire mastery of those skills. Each new step/lesson takes the student about the same amount of time and effort to master the associated content. While higher steps (e.g., later lessons) represent more complex content and skills, from the student's perspective they are not viewed as more difficult because the student has acquired the pre-requisites.

Even though DI is an extremely effective form of instruction that efficiently increases achievement and helps lower performing students to catch up with their peers, it is not a panacea for eliminating low achievement. Comparison studies (Rosenshine, 2002) show that when implemented with fidelity, DI programs do produce achievement gains, but these gains are not always sustained. Many schools with DI programs also combine them with additional programs especially in the areas of reading and math.

Guidelines for Designing Scripted Lessons

After using a commercially-available DI program, many teachers state that they begin using more of the DI principles (small pieces, signaled choral responding) in their classes which do not employ DI curricular materials (Hummel et al., 2004). Beyond just using components of DI in their regular classes, teachers can also develop and use their own scripted lessons (Hummel, Venn, & Gunter, 2004).

Content and skills that represent chained behaviors such as the steps one follows to solve a math word problem, or any other academic activity that has specific steps, are the most likely candidates for teacher-made scripted lessons. Scripted lessons, like any lesson, do not have to be limited to only those skills requiring students to perform at the lower levels of the Bloom, Engelhartt, Furst, Hill, and Krathwohl (1956) taxonomy of cognitive objectives. Through careful planning, scripts can be developed that also teach students how to analyze and evaluate, skills typically associated with problem solving.

To develop scripted lesson plans teachers must first identify relevant state standards. Because most teachers cannot cover all the standards mandated for a particular subject in a grade level, and it takes a more time and effort to develop scripted lessons than it does to develop lessons based on other instructional approaches, we recommend that teachers, at least at first, script lessons that are critical for the students' future success in the subject. Once the appropriate standards are identified, the teacher must convert the standard(s) into a sequential series of objectives that specifically state what the students will have to do after the lesson. After the lesson's objectives are finalized one should do a task analysis on each. There are several reasons why this step is important to developing a successful scripted lesson plan.

A task analysis (TA) can be viewed as a mini-lesson for a single objective. The action students must do in the objective usually is a complex behavior—one made up of a series of more discrete simpler behaviors. One breaks down the complex behavior stated in the objective

into its component parts, a series of behavioral steps that the student will be taught to do, and identifies what pre-requisite knowledge and skills are needed to do each of the components. As Hummel et al. (2004) caution, correctly completing TAs can be tricky *because* teachers know their content so well they often omit or combine steps, which can misdirect students as the steps are taught to the students.

After completing the TAs and identifying their pre-requisites (which the teacher should thoroughly review before starting the script) one converts each step of the TAs into pieces of information that the teacher will orally and/or physically demonstrate. A critical key to script development is to feed/present *one piece of information at a time*. After presenting a piece, the teacher orally presents a question directly related to the piece of information just stated. After an appropriate wait time, the teacher visually or orally signals the students to chorally respond (only call on individuals rarely; the vast majority or oral probes should evoke a choral response). If the students (a) do not answer as a group, or (b) do not answer correctly, the teacher implements a correction feature. If the students do not answer as a group the teacher can simply say, "I need everyone to answer at the same time on my signal. Let's do it again." If the answer is incorrect the teacher does NOT say things like, "That's wrong." Instead, the teacher should state the correct answer, present the piece of information again, and restate the question. When the group comes in on the signal and answers correctly, the teacher should avoid nebulous praise statements such as "good." Instead, firm up the answer by repeating the answer to the question.

Too often in teacher-made scripts, as in other methods of instruction, the teacher covers the content only one time. This is usually insufficient for any type of lesson. In and across lessons the teacher must give frequent opportunities to be actively engaged with new content and reviews of previously covered material.

The pace of the teacher-delivered script is fast, therefore tiring to both instructor and students. As in the commercial DI programs, the actual script itself should take no more than 20 minutes. The remainder of the class period is spent on other activities designed to either help students master content, or to assess what they have learned. These include informal assessments (often called guided practice) that students can do individually or in cooperative learning groups. All the items on these activities, including formal assessments, should be directly related back to one or more of the lesson's objectives. Once students are demonstrating proficiency on the informal activities, they should immediately have a graded seatwork assignment. Homework should be similar in structure to both the informal activities and seatwork assignments. Each completed lesson (i.e., after covering all the objectives) should be followed by a quiz or test Again, each item should directly relate to one or more of the current lesson's objectives, with a few items from previous, related lessons.

The following URL (http://www.edpsycinteractive.org/edpsyc/DI_lp_sentences.doc) links to a lesson covering the four types of sentences. Notice that it begins with an advance organizer (Ausbel, 1978; Walberg, 1999) and the day's objectives are communicated and explained, if needed. Next, a few minutes are spent reviewing the pre-requisites to the day's lesson. (Often, checking homework is part of the review.) Then the day's script is delivered. The script is followed by the informal activity (a written exercise usually). Based on how well the students performed, the teacher may do another such activity, or a formal assessment (seatwork, a quiz, or homework if it is close to the end of the period). A companion URL (http://www.edpsycinteractive.org/edpsyc/lpexam3.html) shows the same lesson using the events of instruction for the general model of direct instruction discussed above.

Summary and Conclusions

While there has been some criticism of the research methodology on which direct instruction is based (Garrison & MacMillan, 1994), especially the atheoretical nature of the results from process-product research, the general guidelines and both the general models and the commercially available approaches to direct instruction have demonstrated their effectiveness in today's classrooms. And rather than an atheoretical approach to instruction, direct instruction, at least in its generic form, is actually an eclectic approach using principles from four of the major learning theories associated with the study of classroom learning. The influence of operant conditioning and behavior analysis, we think, is obvious, based on the advocacy of stating explicit, observable objectives, breaking down of learning into small steps, and correcting and reinforcing mastery of each step. The influence of information processing and cognitive learning theory is seen in the use of advance organizers, the connection of new learning to prior learning, use of higher order questioning, and the advocacy of having students engage in elaboration activities. Other theories of learning have also contributed principles that can be easily implemented in direct instruction. For example, principles advocated in facilitative teaching (a humanistic approach to education; Asby & Roebuck, 1977) such as responding to students' feelings and smiling at students can be implemented throughout a lesson. Components of a social cognitive approach, such as cooperative learning (Johnson & Johnson, 1998; Slavin, 1994) can be readily implemented in the guided or independent practice events of instruction.

Parents and students have every right to expect that students will be provided with high quality instruction that will lead to mastery of a core curriculum at a specified level of competence. Presently, school learning competence is primarily evaluated through standardized tests of basic skills. Critics of standardized testing object that explicitly teaching the objectives measured by the standardized test narrows the curriculum (Kohn, 2001). And yet that is exactly what must be done if we expect all students to cover and demonstrate mastery on an explicit body of knowledge in a specified amount of time. If our society changes the measures of school learning so that they assess a student's ability to inquire (Minstrell & van Zee, 2000) or demonstrate higher-level or critical thinking (Kuhn, 1992; Oxman, 1992) or produce products that would demonstrate their disciplined minds (Gardner, 1999b), then it is entirely appropriate to suggest models of instruction that will accomplish those tasks. However, direct or explicit instruction is most often the selected definition of quality instruction when students are expected to master a broad spectrum of knowledge and skills as advocated by Hirsch (1999) or evaluated by standardized tests, as it is a very efficient way to manage the scarce resources of teacher expertise and classroom time.

Even though this chapter has focused on the design attributes of direct instruction, it should not be assumed that all students will demonstrate mastery of academic content if quality instruction is provided. Carroll (1964) made it clear that because students differ in their capability to learn academic material, educators have two choices. They can either hold all students to an expected level of mastery and allow time-to-learn to vary, or they can hold timeto-learn constant and allow students to attain different levels of mastery. The reality of current education practice is that time-to-learn is held constant for most students (180 days, 5 to 6 hours per day). The efficiency of coverage of a breadth of objectives appears to be more highly valued than effectiveness (i.e., having all students demonstrate mastery of core content). This is a major critique of traditional practice leveled by Bloom (1976). Even in schools or districts where students are provided after-school or Saturday tutoring or opportunities for summer school, these

are seldom mandatory, providing the impression that time-in-the-classroom is the important factor rather than mastery of required content and skills.

In an era of accountability, classroom teachers should be expected to deliver high quality teaching (i.e., planning, management, and instruction). However, other participants should also be held accountable. Schools need to be rightly sized (Howley & Howley, 2004; McMillen, 2004), schools and districts need to provide adequate time for all students to master required content and skills (Berliner, 1990; Caldwell, Huitt, & Graeber, 1982), families need to provide a home atmosphere that facilitates school learning (Evans, 2004; Walberg, 1999), state departments need to provide adequate instructional materials for the objectives that will be tested on mandated criterion- and norm-referenced tests (Bracey, 1987), and the federal government needs to adequately fund its mandates for school improvement (Fratt, 2004). These issues should receive an equally high priority to that of encouraging and training classroom teachers to deliver the highest quality instruction that it is possible to deliver.

References

Aspy, D, & Roebuck, F. (1977). *Kid's don't learn from people they don't like*. Amherst, MA: Human Resources Development Press.

Atkinson, R., & Shiffrin, R. (1968). Human memory: A proposed system and its control processes. In K. Spence & J. Spence (Eds.). *The psychology of learning and motivation: Advances in research and theory* (Vol. 2). New York: Academic Press.

Ausubel, D. (1960). The use of advance organizers in the learning and retention of meaningful verbal material. *Journal of Educational Psychology, 51*, 267-272.

Ausubel, D. (1978). In defense of advance organizers: A reply to the critics. *review of Educational Research, 48*, 251-258.

Berliner, D. (1990). What's all this fuss about instructional time? In M. Ben-Peretz & R. Bromme (Eds.), *The nature of time in schools* (3-35). New York: Teachers College Press. Retrieved November 2009, from http://courses.ed.asu.edu/berliner/readings/fuss/fuss.htm

Block, J. (1971). *Mastery learning: Theory and practice*. New York: Holt, Rinehart, & Winston.

Bloom, B. (1971). *Mastery learning*. New York: Holt, Rinehart, & Winston.

Bloom, B. (1976). *Human characteristics and school learning*. New York: McGraw-Hill.

Bloom, B. S., Engelhart, M. D., Furst, E. J., Hill, W. H., & Krathwohl, D. R. (1956). *Taxonomy of education objectives, handbook I: Cognitive domain*. New York: David McKay.

Bracey, G. (1987). Texts, tests don't match—But does it matter? *Phi Delta Kappan, 68*(5), 397-401.

Brady, M., Clinton, D., Sweeney, J., Peterson, M, & Poynor, H. (1977). *Instructional dimensions study*. Washington, DC: Kirschner Associates, Inc.

Brophy, J. (1983). Effective classroom management. *The School Administrator, 40*(7), 33-36.

Brophy, J., & Good, T. L. (1986). Teacher behavior and student achievement. In M. C. Wittrock (Ed.), *Handbook for research on teaching* (pp. 328-375). New York: Macmillan.

Bruner, J. (1990). *Acts of meaning*. Cambridge, MA: Harvard University Press

Caldwell, J., Huitt, W., & Graeber, A. (1982). Time spent in learning: Implications from research. *Elementary School Journal, 82*(5), 471-480.

Carnine, D. (1988). Breaking the failure cycle in the elementary school. *Youth Policy,10* (7), 22-25.

Carroll, J. (1963). A model of school learning. *Teachers College Record, 64*, 723-733.

Cohen, S. A. (1995). Instructional alignment. In J. Block, S. Evason, & T. Guskey (Eds.), *School improvement programs: A handbook for educational leaders* (153-180). NY: Scholastic.

Cooley, W. W., & Leinhardt, G. (1980). The instructional dimensions study. *Educational Evaluation and Policy Analysis, 2*, 7-26.

Cooper, H. M., Jackson, K., Nye, B., & Lindsay, J. J. (2001). A model of homework's influence on the performance evaluation of elementary school students. *The Journal of Experimental Education, 69*(2), 181-202.

Cooper, H., Lindsay, J. J., Nye, B., & Greathouse, S. (1998). Relationships among attitudes about homework, amount of homework assigned and completed, and student achievement. *Journal of Educational Psychology, 90*, 70–83.

Craik, F., & Lockhart, R. (1972). Levels of processing: A framework for memory research. *Journal of Verbal Thinking and Verbal Behavior, 11,* 671-684.

Cruickshank, D. (1985). Profile of an effective teacher. *Educational Horizons*, 90-92. Darling-Hammond, L. (2000). Teacher quality and student achievement: A review of state policy evidence. *Education Policy Analysis Archives, 8*(1). Retrieved November 2009, from http://epaa.asu.edu/epaa/v8n1/

Dihoff, R., Brosvic, G., Epstein, M., & Cook, M. (2004). Provision of feedback during preparation for academic testing: Learning is enhanced by immediate but not delayed feedback. *The Psychological Record, 54*, 207-231.

Doenau. S. (1987). Structuring. In M. J. Dunkin (Ed.), *International encyclopedia of teaching and teacher education* (398-407). Oxford: Pergamon.

Englemann, K. (2004). Direct instruction model (K-8). In J. Raphael (Ed.), *The catalog of school reform models*. Portland, OR: Northwest Regional Educational Laboratory. Retrieved November 2009, from http://www.nwrel.org/scpd/catalog/ModelDetails.asp?modelID=13

Engelmann, S. (1999, July). *Student-program alignment and teaching to mastery.* Paper presented at the 25th National Direct Instruction Conference, Eugene, OR.

Engelmann, S., and others. (1999). *Corrective reading*. New York: SRA/McGraw-Hill. Retrieved November 2009, from http://www.sraonline.com/index.php/home/curriculumsolutions/di/correctivereading/102

Evan, R. (2004). *Family matters: How schools can cope with the crisis in childrearing*. San Francisco: Jossey Bass.

Fagan, E., Hassler, D., & Szabo, M. (1981). Evaluation of questioning strategies in language arts instruction. *Research in the Teaching of English, 15*, 267-273.

Fisher, C., Filby, N., Marliave, R., Cahen, L., Dishaw, M., Moore, J., and Berliner, D. (1978). *Teaching behaviors: Academic Learning Time and student achievement: Final report of Phase III-B, Beginning Teacher Evaluation Study*. San Francisco: Far West Laboratory for Educational Research and Development.

Flanders, N. (1970). *Analyzing teacher behavior.* Reading, MA: Addison-Wesley.

Fratt, L. (2005, February). Education budget rises but falls short of needs. *District Administration*, 12.

Gage, N. (1978). *The scientific basis of the art of teaching*. New York: Teachers College Press.

Gage, N. (1994). The scientific status of research on teaching. *Educational Theory, 44*(4). Retrieved November 2009, from http://www.ed.uiuc.edu/EPS/Educational-Theory/Contents/44_4_Gage.asp

Gage, N., & Berliner, D. (1998). *Educational psychology* (6th ed.). Boston: Houghton Mifflin.

Gagne, R., & Briggs, L. (1979). *Principles of instructional design* (2nd ed.). New York: Holt, Rinehart, & Winston.

Gardner, H. (1999a). Multiple approaches to understanding. In C. Reigeluth (Ed.), *Instructional-design theories and models (Vol II). A new paradigm of instructional theory* (pp. 69-89). Mahwah, NJ: Lawrence Erlbaum.

Gardner, H. (1999b). *The disciplined mind. Beyond facts and standardized tests, the K-12 education that every child deserves*. New York: Penguin Books.

Garrison, J., & MacMillan, C. (1994). Process-product research on teaching: Ten years later. *Educational Theory, 44*(4). Retrieved November 2009, from http://www.ed.uiuc.edu/EPS/Educational-Theory/Contents/44_4_Garrison.asp

Gersten, R., Taylor, R., & Graves, A. (1999). Direct instruction and diversity. In R. Stevens (Ed.) *Teaching in American schools* (pp. 81-102). Upper Sadler River, NJ: Merrill.

Good, T., & Grouws, D. (1979). The Missouri Mathematics Effectiveness Project: An experimental study in fourth-grade classrooms. *Journal of Educational Psychology, 71*, 355-362.

Gronlund, N. (2003). *Writing instructional objectives for teaching and assessment* (7th ed.). Upper Saddle River, NJ: Prentice Hall.

Grossen, B. J. (1996). How should we group to achieve excellence with equity? *Effective School Practices, 15* (2), 2-16.

Grossen, B. J. (2002). The BIG accommodation model: The Direct Instruction Model for secondary schools. *Journal of Education for Students Placed At Risk, 7*(2), 241-263.

Gunter, P., Venn, M., & Hummel, J. (2001). *Improving the dynamics of academic interactions. How to script lessons*. Valdosta, GA: Valdosta State University. Retrieved November 2009, from http://www.edpsycinteractive.org/files/scripted_lessons.pdf

Guskey, T., & Gates, S. (1986). Synthesis of research on the effects of mastery learning in elementary and secondary classrooms. *Educational Leadership, 43*(8), 73-80.

Guskey, T., & Pigott, T. (1988). Research on group-based mastery learning programs: A meta-analysis. *Journal of Educational Research, 81*(4), 197-216.

Hempenstall, K. (2001, December 12). What's the difference between "direct instruction" and Direct Instruction? Message posted to Direct Instruction listserve, owner-di@lists.uoregon.edu

Hirsch, E. D. (1996). *The schools we need: And why we don't have them*. New York: Doubleday.

Howley, C. & Howley, A. (2004). School size and the influence of socioeconomic status on student achievement: Confronting the threat of size bias in national data sets. *Education Policy Analysis Archives, 12*(52). Retrieved November 2009, from http://epaa.asu.edu/epaa/v12n52/v12n52.pdf

Huitt, W. (1997). *The SCANS report revisited*. Paper delivered at the Fifth Annual Gulf South Business and Vocational Education Conference, Valdosta State University, Valdosta, GA, April 18. Retrieved November 2009, from http://www.edpsycinteractive.org/topics/student/scanspap.html

Huitt, W. (2001). Direct instruction: A transactional model. *Educational Psychology Interactive*. Valdosta, GA: Valdosta State University. Retrieved November 2009, from http://www.edpsycinteractive.org/topics/instruct/instevnt.html

Hull, C. L. (1943). *Principles of behavior. An introduction to behavior theory*. New York: Appleton-Century

Hummel, J., Venn, M., & Gunter, P. (2004). Teacher-made scripted lessons. In D. J. Moran & R. W. Malott (Eds.), *Empirically supported education methods: Advances from the behavioral sciences* (pp. 95-108). San Diego, CA: Elsevier/Academic Press.

Hummel, J., Wiley, L., Huitt, W., Roesch, M., & Richardson, J. (2004). Implementing *Corrective Reading*: Coaching issues. *Georgia Educational Researcher*, 2(1). Retrieved November 2009, from http://coefaculty.valdosta.edu/lschmert/gera/vol__2_no__1.htm

Hummel, J., & Huitt, W. (1994, February). What you measure is what you get. *GaASCD Newsletter: The Reporter*, 10-11. Retrieved November 2009, from http://www.edpsycinteractive.org/papers/wymiwyg.html

Hunter, M. (1982). *Mastery teaching*. El Sequndo, CA: TIP Publications.

Johnson, D., & Johnson, R. (1998). *Learning together and alone: Cooperative, competitive, and individualistic learning* (5th ed.). Boston: Allyn & Bacon.

Joyce, B., & Weil, M., & Calhoun, E. (2003). *Models of teaching* (7th ed.). Boston: Allyn & Bacon.

Kame'enui, E. J., Carnine, D. W., Dixon, R. C., Simmons, D. C., & Coyne, M. D. (2002). *Effective teaching strategies that accommodate diverse learners* (2nd ed.). Upper Saddle River, NJ: Merrill Prentice Hall.

Klingele, W., & Reed, B. (1984). An examination of an incremental approach to mathematics. *Phi Delta Kappan, 65*(10), 712-713.

Kohn, A. (2001). Fighting the tests: A practical guide to rescuing our schools. *Phi Delta Kappan, 82*(5), 348-358. Retrieved November 2009, from http://www.alfiekohn.org/teaching/ftt.htm

Kozloff, M. A. (2003). Seeing is believing versus believing is seeing: The fundamental problem in education. *Direct Instruction News, 3*(1), 15-19.

Kulik, J. A., & Kulik, C. C. (1987). Effects of ability grouping on students' achievement. *Equity & Excellence, 23* (1-2), 22-30.Mager, R. F. (1975). *Preparing instructional objectives.* Belmont, CA: Fearon.

Kuhn, D. (1999). A developmental model of critical thinking. *Educational Researcher, 28*, 16-25, 46.

Mager, R. (1997). *Preparing instructional objectives: A critical tool in the development of effective instruction* (3rd ed.). Atlanta, GA: CEP Press.

Martin, J. A. (1999). *Effects of cooperative learning on the achievement of secondary students*. Unpublished educational specialist's thesis, Valdosta State University, Valdosta, Georgia. McCarthy, B. (2000). *About learning*. Wauconda, IL: Excel, Inc.

McMillen, B. J. (2004, October 22). School size, achievement, and achievement gaps. *Education Policy Analysis Archives, 12*(58). Retrieved November 2009, from http://epaa.asu.edu/epaa/v12n58/v12n58.pdf

Minstrell, J., & van Zee, E. (Eds.). (2000). *Inquiring into inquiry learning and teaching in science*. Washington, DC: American Association for the Advancement of Science.

Moll, L. (Ed.). (1992). *Vygotsky and education: Instructional implications and applications of socio-historical psychology*. New York: Cambridge University Press.

Partnership for 21st Century Skills. (2003). *Learning for the 21st century*. Washington, DC: Author. Retrieved November 2009, from http://www.21stcenturyskills.org/downloads/P21 Report.pdf

Perkins, d. N. (1992). *Smart schools: Better thinking and learning for every child.* New York: The Free Press.

Proctor, C. (1984). Teacher expectations: A model for school improvement. *The Elementary School Journal*, 469-481.

Oxman, W. (Ed.). (1992). *Critical thinking: Implications for teaching and teachers*. Upper Montclair: Montclair State College.

Reigeluth, C. M. (1999). What is instructional-design theory and how is it changing? In *Instructional-design theories and models: Volume II* (pp. 5-29). Mahweh, NJ: Lawrence Erlbaum.

Rosenshine, B. (1986). Synthesis of research on explicit teaching. *Educational Leadership, 43*(7), 60-69.

Rosenshine, B. (1995). Advances in research on instruction. *The Journal of Educational Research*, *88*(5), 262-268.

Rosenshine, B. (2002). Helping students from low-income homes read at grade level. *Journal of Education for Students Placed At Risk, 7*(2), 273-283.

Rosenshine, B., & Stevens, R. (1986). Teaching functions. In M. Wittrock (Ed.), *Handbook of research on teaching* (3rd ed.) (pp. 376-391), New York: McMillan.

Rowe, M. (1974a). Wait-time and rewards as instructional variables, their influence on language, logic and fate control: Part I, Fate Control. *Journal of Research in Science Teaching*, *11*, 81-94.

Rowe, M. (1974b). Relation of wait-time and rewards to the development of language, logic, and fate control: Part II, Rewards. *Journal of Research in Science Teaching*, *11*, 291-308.

Secretary's Commission on Achieving Necessary Skills, The. *(*1991). *What work requires of schools.* A SCANS Report for America 2000. Washington, DC: U.S. Department of Labor. Retrieved November 2009, from http://wdr.doleta.gov/SCANS/whatwork/whatwork.pdf

Saxon, J. (1982). Incremental development: A breakthrough in mathematics. *Phi Delta Kappan, 63*, 482-484.

Slavin, R. (1986). *Educational psychology* (1st ed.). Boston: Allyn & Bacon.

Slavin, R. (1994). *Cooperative learning: Theory, research, and practice*. Upper Saddle River, NJ: Prentice Hall.

Slavin, R. (1997). *Educational psychology, theory and practice* (5th ed.). Boston: Allyn and Bacon.

Squires, D., Huitt, W., & Segars, J. (1983). *Effective classrooms and schools: A research-based perspective.* Washington, DC: Association for Supervision and Curriculum Development.

Stallings, J., & Kaskowitz, D. (1974). *Follow Through classroom observation evaluation, 1972-1973*. Menlo Park, CA: Stanford Research Institute.

Vygotsky, L. (1978). *Mind in society*. Cambridge, MA: Harvard University Press.

Walberg, H. (1986). Synthesis of research on teaching. In M. Wittrock (Ed.), *Handbook of research on teaching* (3rd ed.) (pp. 214-229). New York: Macmillan.

Walberg, H. (1991). Productive teaching and instruction: Assessing the knowledge base. In H. Waxman & H, Walberg (Eds.), *Effective teaching: Current research* (33-62). Berkeley, CA: McCutchan.

Walberg, H. (1999). Generic practices. In G. Cawelti (Ed.), *Handbook of research on improving student achievement* (pp. 9-21). Arlington, VA: Educational Research Services.

Walberg, H. (2003). *Improving educational productivity*. Philadelphia: Laboratory for School Success. Retrieved November 2009, from http://www.temple.edu/lss/pdf/publications/pubs2003-1.pdf

Walberg, H., & Paik, S. (2000). *Effective educational practices*. Paris: International Bureau of Education, UNESCO. Retrieved November 2009, from http://www.ibe.unesco.org/International/Publications/EducationalPractices/EducationalPracticesSeriesPdf/prac03e.pdf

Walberg, H., Paschal, R., & Weinstein, T. (1985). Homework's powerful effects on learning. *Educational Leadership, 42*(7), 76-79.

Watkins, C. L. (1988). Project Follow Through: A story of the identification and neglect of effective instruction. *Youth Policy, 10*(7), 7-11.