Research on Direct Instruction: 25 Years Beyond DISTAR

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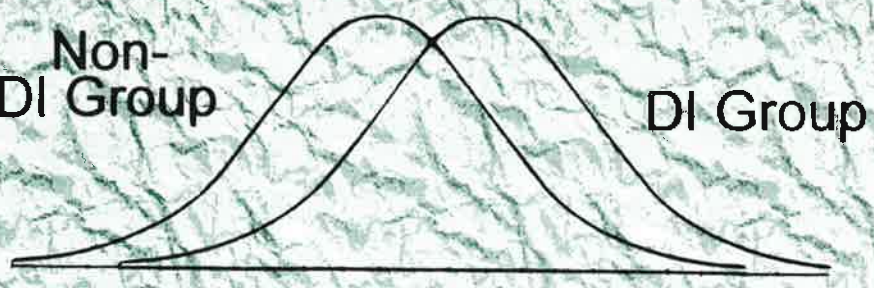

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CHAPTER 3

Myths about Direct Instruction

Critics have damned and demeaned the Direct Instruction philosophy and programs for a number of reasons. The criticisms of Direct Instruction are typically not based on a solid understanding of the programs, students, or logic. This chapter presents the more prominent myths that have been leveled against DI. Some of the myths are based on real features of the DI scheme, but draw faulty conclusions. Others are based on misconceptions of students, teachers, or instruction.

Myth 1: DI programs are rigid and unenlightened because they treat all instructional tasks as if they have right and wrong answers.

Indeed, Direct Instruction programs deal with only answers that are "correct" or "preferable." The reason is that for all intellectual learning, there can be only right and wrong answers. This assertion becomes very obvious if one considers the act of teaching. If a teacher tried to teach any content, discrimination, operation, or skill and there were no responses that were better than any others, the teacher would be unable to teach and would have no basis for responding to the student's productions. Without clear rules about what is considered "correct," a teacher during a favored art activity would have to accept behaviors like children throwing knives at each other or sleeping. These responses, after all, would be just as good as any others.

The fact that answers are either right or wrong does not imply that we know everything. Stated differently, the correct answer to some questions is "I don't know." If we asked whether Lincoln was the first president, the answer is "no." If we asked about Washington, the answer is "yes." If we ask about who would be future presidents, the answers would have to express the idea that nobody knows with certainty. Answers that deviate from this classification system are categorically incorrect. If somebody indicated that Lincoln was the first president, the answer is wrong.

The issue of correctness does not mean that for any question there is only one correct answer. There may be hundreds of correct answers to questions that are not yes-no questions. For example, "Name some presidents of the United States." An answer could consist of 15 names, some of which are correct and some of which aren't. Similarly, "Name some things you could do with a brick" generates many "correct" answers. Some things are possible; others aren't. If a person said, "I'd get on it and ride across the U.S.," the answer (with no further elaboration about the vehicle that was providing the transportation) is incorrect.

The myth about correct answers is promulgated largely as an excuse for a very poor analysis of the subject that is to be taught. If the subject is well understood and the program is well designed, it should be possible to specify the correct answers or acceptable responses for every activity in the program.

Myth 2: Direct Instruction programs are spurious because they are based on the hierarchies of skills, but there are no universal skill hierarchies.

This is one of the least enlightened comments that could be made about instruction. The necessity of hierarchies is easily demonstrated in any subject. In math, for instance, we could provide a student with a word problem, the solution to which is a ratio. (Fish and frogs are in a pond. If there are 5 fishes for every 7 frogs and if there are 280 frogs in a pond, how many fish are in the pond?) The student who is supposed to work this problem independently by reading the problem and then solving it would categorically fail the task if the student could not read. Reading, therefore, is a logically necessary prerequisite to solving the word problem independently.

If the student could read but could not solve the problem, we could identify, through a series of tests, **all of the component skills the student did not know,** and we could specify all the things the student would have to learn before solving problems similar to the original one. Let's say that the student did not know how to set up the problem. We could present the student with the problem already set up and see if she could solve it:

$$\frac{\text{fish}}{\text{frogs}} \qquad \frac{5}{7} \qquad = \qquad \frac{\square}{280}$$

If the student could not solve it in this form, we could discover whether the student could read the equation. Could the student figure out the factor for the bottom numbers if asked to do so? ("What do you multiply 7 by to get 280?") If we told the student the factor for the bottom numbers, could the student work the problem for the top numbers? ("What do you multiply 5 by to get the answer to the problem? ... What's 5 times 40?")

The various tests provide a clear hierarchy of logically necessary teachings that must occur. Although there are different ways to solve the problem, the students in a specific sequence will solve it a specific way. **There is no single way to provide for the teaching of the problem type, but any procedure used to achieve the teaching would have to account for all the logically necessary prerequisites.**

The criticism that Direct Instruction has a hierarchical skill structure comes from those who do not believe that there should be systematic preparation. The current idiom for teaching math provided by the NCTM is to teach skills as they are needed, not before the fact, but in response to projects or activities that call for particular operations or concepts. Given that the student must learn the logically necessary prerequisites before solving any of these problems, the teach-as-needed plan is not very intelligent because students may encounter problems that require a great deal of on-the-spot teaching. If the teacher attempts to pack all this teaching into one session, the result will be that many students won't learn the key math operations, that the teacher will "lead" them through the project (with the students being passive followers), and that the students will not see the activity as an extension of what they already learned about math (because they have not learned the math). The result will be student dependency.

DI programs are hierarchical, which means that the learning is measured out in small, progressive amounts. Every concept and discrimination needed for future applications is taught and practiced before the application is presented, thereby guaranteeing that all students will be active participants in complicated applications and projects. A project would be introduced only after students had mastered all the calculation types and all the word-problem types that correspond to details of the real-life activity. The real-life activity should serve as confirmation of the various things students have learned.

Myth 3: Direct Instruction eschews developmental progression and developmental theory.

This myth is actually a myth about developmental theory and developmental appropriateness. It is true that DI programs passionately eschew developmental theory. The reason is that developmental theory is of no use in designing programs. If we were to apply developmental standards as a basis for determining when students are to be taught different skills, we would delay the teaching of populations, such as urban blacks, and we would effectively discriminate against these populations. In fact, this is what the National Association for the Education of Young Children (NAEYC) suggests, when it asserts that if "developmentally appropriate" practices are provided, some children will not learn to read before ages 8 or 9.

If the NAEYC's assertion suggests what is possible with **any** teaching practice, it is rigorously refuted by the performance of developmentally "delayed" students who go through Direct Instruction reading programs. They read in one school year (long before they are 8 or 9).

All questions of development should be seriously scrutinized for the simple reason that they are contaminated. **They indicate the development in a particular teaching environment or setting.** The rate of development achieved applies only to that setting. The extent to which the development can be modified is determined by increasing the rate and efficiency of the teaching—changing the environment.

In the final analysis, statements about development are relatively useless to the teacher. They do not provide information about where to start instruction for any child in a group, because they don't assess which of the skills relevant to the subject the child knows. Appropriately placing students requires specific performance tests that measure instructional objectives. Statements about development provide neither this type of information nor information about the rate at which the student would meet the various objectives. At best, they could generate some global predictions that are true of the average child. Unfortunately, the teacher works with specific students, each with specific skills and deficits.

Some early DI studies dealt with developmental theory and the extent to which acceleration is possible with different types of students. The results of these studies contradicted predictions based on developmental theory. Developmentally immature students learned sophisticated math operations and logical schemata that permitted them to outperform the average 10-year-old in specific areas (Engelmann, 1967b). Developmental predictions about children's intellectual performance are not confirmed when the environment provides effective instruction.

The notion that students cannot learn if they are not ready is true, but in a very technical sense, not in the global sense normally suggested by traditional readiness statements. **Readiness can be clearly articulated by comparing the child's performance to the goal behaviors.** The differences indicate what the child must learn to achieve the goal. When instruction begins where the child is and effectively addresses the different skills that are needed to reach the objectives, significant acceleration is achieved and the child is able to master cognitive operations that would be predicted to be far beyond the child's apparent "readiness."

Myth 4: Direct Instruction's scripted presentations and predetermined lessons stifle the teacher's creativity.

Often, the creativity of a teacher is confused with that of students. If the students engage in projects or activities that are traditionally labeled as creative, the teacher is judged to be creative. The most germane indices of teacher creativity, however, are how well the teacher succeeds at teaching—accelerating student performance and teaching students things they typically have trouble learning. The creative potential of students is limited by what they know. The first job of the teacher, therefore, is to teach basic skills and knowledge. The foundation of skill and knowl-

edge provides students with the fabric to be fashioned by creativity. Skills lead naturally to creative extensions.

Some current approaches to math instruction encourage students to be creative and make up their own algorithms. Unfortunately, students cannot be productively creative in math without first having a fair understanding of math. Attempts to short circuit the skill requirement result in homemade algorithms that are not effective.

Traditional appeals to teachers suggest that they are creative and understand how to execute creative solutions to problems of student learning. Declining achievement scores do not support this belief. For example, NAEP scores in California suggest that the **average** 7th grade student has a learning disability.

Weaknesses in teachers' reinforcement skills (versus presentation skills) were revealed by videodisc instructional programs that required the teacher to manage, not to present. While there was great variability in teacher performance, the average teacher needed substantial training to achieve good student performance in this context, and needed substantially more training to perform in a setting that required the teacher to present content and to manage (reinforce, correct, and review). Discussions of teacher creativity are premature if the teacher is not achieving attainable instructional goals.

Direct Instruction programs are scripted and specified so they serve as an attainable standard. As noted earlier, teachers often need training, not in things that are unique to DI programs, but in basic practices of grouping, pacing, correcting, and reinforcing. Whether or not the teacher uses DI programs, teachers need the same set of general teaching behaviors if they are to accelerate student performance. These behaviors are most easily learned within the context of DI programs because curricular details are in place, which means that if the teacher manages and teaches appropriately, the teacher will see an immediate difference in student performance.

Once the teacher has mastered the basics and is able to achieve attainable results, the teacher has a basis for being creative. The teacher has a template of how to teach particular content, an understanding of which details are needed, and knowledge of how much practice different students require. The teacher then can take some shortcuts and modify the sequence she presents to her students. The teacher can extend and integrate what students have learned through projects and activities that require students to work cooperatively.

Before a teacher can become a creative teacher, however, the teacher must be successful at teaching. To skip over this requirement is to be creative in a way that does not serve students.

Myth 5: DI programs are appropriate for low performers only.

This assertion reveals a fundamental lack of understanding of students and learning. For this statement to be true, low performers would perform in a generically different manner than high performers. Generically different presentations would work for lower performers, but would not work for higher performers. For instance, lower performers would learn from manipulation while higher performers would not.

No such unique tendencies have ever been observed. Work with students of different abilities reveals that higher performers require less repetition, less review, fewer examples, and often less reinforcement than lower performers. Lower performers may have concept and skill deficiencies that the higher performers of the same age do not have, and these deficiencies require time to remedy. Lower performers who have been through traditional instruction (including traditional kindergarten) may also have serious misconceptions about their role in school and about how to learn.

Because no mistakes or tendencies are unique to lower performers, if one is able to teach a complex skill, such as reading, to lower performers, it is much easier to teach the same skill to higher performers. **Therefore, any instructional sequence that is effective with lower**

performers would be equally effective with naive higher performers. Note that the higher performers may be younger than lower performers who are at the same skill level. Given that both the higher performer and the lower performer do not know a particular skill, however, and given that both start at about the same level of naiveté, both would have to learn the same information, operations, or processes. There would be no possible shortcuts for the higher performer, and no unique information or process for the lower performer. If the presentation is consistent with more than one interpretation, both higher and lower performers would be faced with the same choices, and there would be the same mistakes in both groups.

The basic rule is that **if the learning task is the same, we may use the same steps to induce the learning.** For example if we expect the student to orally decode regularly spelled words like *man* and *top*, the visual, auditory, associative, and kinesthetic requirements are identical for a lower performer and a higher performer. Both would have to learn something about the order of the letters and the pronunciation of the word. We would not have pure "visual" students because the task requires visual inspection of the word, but it also requires an auditory-vocal component (saying the word). Whatever links are required to connect the visual with the vocal must be functionally the same for both students. Given that students are taught an effective operation for decoding regularly-spelled words, all students who apply the operation would decode simple words and would reliably discriminate between words that are otherwise similar: *tap, pat, top, tip, pot, pit,* etc. The only necessary variation in how the material is appropriately presented to high and low performers is rate—how fast, how much repetition and review.

The ultimate argument that DI works with higher performers is based on empirical evidence. Various studies document that DI used with regular-classroom populations accelerates the performance of both higher and lower performers (Robinson & Hesse, 1981; Sexton, 1989; Tarver & Jung, 1995; Vitale & Romance, 1992).

Since Direct Instruction works with lower performers, DI is uniformly effective with higher performers even if the presentation is speeded and the criterion of performance for the students is lowered. **The fact that research shows that DI programs have accelerated lower performers beyond higher performers who receive other programs provides the ultimate challenge to the suggestion that the programs are appropriate only for lower performers.** The paradox is that the lower performers become higher performers. Therefore, the program that is ostensibly appropriate only for lower performers is prima fascie appropriate for higher performers.

The reasons that DI has become associated with lower performers are: (a) it works with lower performers and is therefore used more extensively with these students (whereas other materials tend to be ineffective with this population) and (b) traditional "regular" education systems have used its guidelines, standards, and extensive propaganda to exclude DI programs. In state adoptions for California, Oregon, and other states, DI programs are routinely rejected on the grounds that they do not meet the criteria set by these state systems. Ironically, students in these states, especially California, who have potential to be very high performers achieve incredibly poor results. Similarly, standards used by the National Council of Teachers of English, National Council of Teachers of Mathematics, International Reading Association, and other professional organizations are antipathetic to the structure and content of DI programs, which means that professional groups reject Direct Instruction programs, even though these groups have a history of promoting ineffective practices.

Myth 6: DI promotes passive learning.

According to this myth, Direct Instruction programs induce learning in such small steps and make it so easy for students that they become dependent on the teacher for teaching and fail to develop the spirit needed to learn through their own efforts. It is true that DI students may become dependent on the teacher as a source of information and skill. The question is whether

these students lose the ability or desire to learn on their own. No such evidence exists, and there are suggestions that the structured learning may make discovery learning and independent pursuits easier for students, because they have a better understanding of how to organize and master new material (Brophy & Good, 1992).

The DI orientation to student learning is that there is a place in the curricular sequence for assignments that require the student to wrestle with the content before completing the assignment. However, **students learn how to learn through mastery**. Only mastery of a concept or operation provides the student with information about how to organize rules, facts, and operations; how to attend; how to apply; and how to focus on those details that are to be remembered. It is important for the student to become facile at discovery; however, it doesn't follow that an effective way to achieve this goal is to immerse the student in the discovery experiences. The fact is that the student will learn useful strategies only from **successful discoveries,** so the first goal is to make sure the student has all the tools needed to achieve success.

DI instructional units are successively more complicated and less structured, so that students continue to learn about learning as they assimilate the content. After thoroughly mastering the content, students are presented with problems that involve mental wrestling, which have learning requirements that are not observed in simpler learning assignments. At this point, however, the probability is very high that students have the tools and knowledge needed to succeed.

A related myth about Direct Instruction is that DI structured lessons "make it easy" for students to learn, and therefore discourage independent learning. The proof of whether students are discouraged from learning on their own is seen in the projects or extensions in various DI programs. When students receive good instruction in the program, they create clever solutions to problems, clever counter-arguments to position papers, and clever ideas for inventions. More research is needed on creative applications, but it is an axiom that a student who has completed five years of a well-executed DI sequence is in a position to be more creative than a comparable student who has gone through a traditional sequence. The DI student has more skill and information to use in a creative application and has had more experience in applying skills and knowledge to a variety of project contexts.

Myth 7: DI ignores individual differences.

As noted earlier, the test of whether a program or sequence is cognizant of individual differences is simply whether the program accommodates students of varying abilities and styles. If students learn content on the projected time schedule, their performance is a clear declaration that the program, for whatever reasons and through whatever provisions, accommodates the full range of individual differences.

Direct Instruction programs used in elementary grades have provisions for placing and accelerating students. For example, multiple-entry points and in-program tests measure mastery, especially on the new material introduced in the preceding ten-lesson period. Remedies are specified for unacceptable performance. (A remedy consists of repeating specified parts of different lessons.) Furthermore, all programs admit to a functional test that determines whether each child in the group is appropriately placed. The test:

- Are the children at least 70% correct on any component of the lesson that has been introduced in the preceding lessons?
- Are the children at least 90% correct on components that have been introduced more than 2 lessons earlier?
- Is the teacher able to go through the lesson within (or close to) the specified time for the lesson?
- Are all children virtually 100% correct on all material at the end of the lesson?

This test applies to the group, but has implications for individual children. Students who fail the test may be inappropriately placed. The remedy is to move them to a group in which they will be able to pass the test. Even if students are appropriately placed in a sequence, the teacher must respond to individual students by varying the amount of practice for particular parts of the lesson and varying the amount of review.

Possibly, the most important feature for individualization is the amount of surplus practice that is in DI programs. All DI programs provide cumulative review of earlier-taught material. Once something is introduced to students, it does not go away. It is expanded and incorporated in various operations or applications and it is reviewed. The message to the students is that what is introduced is mastered and is used.

The prejudice of traditional programs holds that if students are not working hard and exhibiting behaviors associated with hard work (head scratching, apparent rumination and experimentation) the program is judged too easy for students. Basically, this prejudice confuses the difficulty students are experiencing with the difficulty of the material.

The pervasive nature of this confusion about "hard work" was revealed most dramatically with the beginning level (Level A) of *Spelling Mastery*. Several tryout teachers and many teachers who have used the published version of this program have commented that the program was too easy for their students. The tryout teachers indicated that students were not "challenged" and did not have to work hard. When teachers were asked about whether they had been able to teach spelling as effectively before using the program (teach as many spelling words within the time period of the program), they uniformly responded, "No." The teachers indicated that it just didn't feel right for students to learn the material that easily. They seemed to assume that if the sequence was good, it had to be hard. If it wasn't hard, it couldn't be good.

Initial teaching in DI programs does not always "challenge" students. The rationale:

1. During the school day, the teacher will teach other things that are challenging;
2. If students are on an extended diet of working on challenging activities, they will either lose interest or will tire; and
3. If students can learn some material without being challenged (without difficult practice), the learning presents both effective instruction and relief from hard work.

Myth 8: It is possible to use effective-school practices to achieve results as good as those achieved by Direct Instruction.

This myth results from a confusion between causation and correlation. There are different aspects of a Direct Instruction teaching situation that are highly visible, that can be counted, and that are different from features of traditional or discovery programs. The teacher is not a facilitator but a teacher, a fact that is easily quantified by the number and type of directions the teacher issues to the students. The presentation involves group responses, often at a very high rate. There are corrections, high rates of praise, and similar visible features. The features that are not easily identified by such observations, however, have to do with the curriculum or the qualitative information about what students are doing. DI content is often assumed to involve rote learning or basic learning, not higher-order thinking. This judgment seems to be based on the fact that students are responding orally in an apparently regimented fashion. The judgment about content in other words is made totally on the basis of **the form of the response,** not on how the different details of the content are linked together. The visible features of DI have become part of what is called effective-school practices as articulated by Rosenshine, Stallings, and others (Ellis & Fouts, 1993).

Installation of these "effective" practices without a systematic instructional sequence will not necessarily lead to highly effective teaching. It may result in improvement over what had been

achieved, but it will not cause superior performance. The reason is that the curricular sequence is solely responsible for the various concepts and skills that are to be induced in the naive student. No magic is to be found in repeating statements that are relatively trivial or in engaging in tasks that do not have identifiable instructional functions. **If the instructional sequence is weak, the effective-schools trappings will not make it strong.**

This fact is illustrated by the traditional orientation to the teaching of fractions. The naive student is first introduced to three fractions: one-half, one-third, and one-fourth. These are poor examples from an instructional design standpoint. They suggest to the naive student that all fractions involve one part and that the denominator of the fraction gives all the necessary information about the "part" that is shown. If one were to use DI techniques (but not program sequences) to teach a traditional sequence for introducing fractions, the students would perform better on the initial work. However, they would have even greater difficulties than traditional students when other fractions were introduced later. The students would simply have learned an inappropriate interpretation more thoroughly than they would have in a traditional sequence. Clearly, without the content being the central focus and key ingredient of instruction, great acceleration is not possible.

The ultimate test of whether effective-school practices yield results as consistent or as good as Direct Instruction comes from attempts to use these practices to accelerate student performance. During the 1970s, there were various "mastery learning" projects that usually involved traditional material and formats combined with techniques that have been identified as effective-school practices (Ellis & Fouts, 1993). The results were very poor. Although some applications showed modest performance gains, the results were not on a par with those achieved by DI.

Madeline Hunter (1980) developed an extensive system based on effective-school practices. She asserted that the system would produce results with any curricular system (which means that the particular instructional system used is not viewed as being a key variable). The Hunter system required a great deal of work for all people in the school (from administrators to aides). Staff members had extensive assignments for securing data, installing various practices, and reporting. The training was costly. Evaluations of results, however, showed that with all the effort involved in implementation, the typical school achieves virtually no gain in student performance (Slavin, 1989). Despite the fact that the various components and procedures are observed in effective systems, Hunter's system is not effective, because it lacks a key ingredient—an effective curriculum. Ironically, if an effective curriculum were in place, many of the tasks required by the Hunter system would not be necessary.

Direct Instruction programs are tools that may be used effectively as part of an implementation that is effective. It is possible to teach content effectively without using DI programs, and it is possible to use DI ineffectively. Success of students depends largely on what teachers do. If the teaching is appropriate and responsive, the students will learn well. When Direct Instruction programs are used as intended, they facilitate responsive teaching.