National Institute for Direct Instruction

Summary of Literature Regarding the Effectiveness of Direct Instruction and Projections of Changes in Achievement

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This short report includes two sections. The first summarizes the research literature related to Direct Instruction (DI). The second provides estimates of the gains in student achievement that would be expected when students have Direct Instruction using data from a very extensive review of the literature.

Studies of the Effectiveness of Direct Instruction

The scientific literature emphasizes the importance of multiple tests, or replications, of studies to ensure that conclusions are accurate. Over the last five decades there have been many studies of Direct Instruction's efficacy, and several researchers have reviewed and summarized this vast literature. They have found strong and consistent evidence of DI's effectiveness.

Two approaches are typically used in reviewing research studies: systematic literature reviews and meta-analyses. Both approaches begin with a delineation of the topic to be covered. For instance, some have looked only at studies of reading or of mathematics. Some have focused on studies of whole school reform. Some may look only at special populations, such as students with disabilities. Systematic literature reviews and meta-analyses may also use methodological criteria to limit the range of studies examined, such as sample size or the nature of the research design. Once the researchers have determined the topic and criteria to be used, they try to amass all the relevant studies and then carefully examine their findings.

The procedures used to summarize the findings differ slightly for the two approaches. Systematic literature reviews usually involve narrative summaries of the results. They describe the nature of each study; then, compare and contrast conclusions. These reviews usually include simple tallies of the outcomes, noting the proportion of results that are positive, negative, or indeterminate. Meta-analyses use a more statistical approach. They translate results into a common numerical metric, usually an effect size, and statistically analyze variations in the metric and factors that might influence it.

All of the literature reviews and meta-analyses of Direct Instruction materials have found strong evidence of their effectiveness. Their findings are corroborated by recent research

conducted by the National Institute for Direct Instruction. Summaries of conclusions within each of the reviews and of NIFDI research are given below. Bibliographic citations are at the end of this report.

Meta-Analyses of DI Programs

Six meta-analyses have examined Direct Instruction programs. All of these analyses have concluded that DI programs have highly positive effects on student achievement and that they are more effective than other curricular approaches.

- John Hattie (2009) examined meta-analyses of over 300 research studies relating to student achievement and concluded that Direct Instruction is highly effective. No other curricular program showed such consistently strong effects with students of different ability levels, of different ages, and with different subject matters.

- Borman and associates (2003) examined studies of 29 comprehensive school reform models. They found that much more evidence was available for the Direct Instruction model than for other interventions. Direct Instruction was found to produce the strongest effects of all models examined.

- Adams and Engelmann (1996) conducted a meta-analysis of 34, highly controlled studies that looked at the effectiveness of Direct Instruction programs. They found very strong, positive results.

- Coughlin's (2011) meta-analysis focused on 20 studies of Direct Instruction that employed a randomized control group design. Strong positive effects were found with reading, language, mathematics, and other areas. Similar results appeared with general education and special education students.

- Stockard (2013) used meta-analytic techniques to examine data from scores on state assessment tests from 18 different sites. Again, strong effect sizes were found. Results were similar across different grades, schools with different SES and racial-ethnic composition, and in different areas of the country.

Literature Reviews

Several systematic literature reviews have documented the efficacy of Direct Instruction programs.

- Kinder and associates (2005) summarized the results of 45 studies that used Direct Instruction materials with students with disabilities. Over 90 percent of these studies found positive effects for the Direct Instruction programs.

- Przychodzin and colleagues (2004) reviewed the results of 12 studies of DI math programs published since 1990. Some studies involved general education students and some also included students with disabilities. All but one of the studies showed positive results.

- Przychodzin-Havis and colleagues (2005) reviewed 28 published studies of the Direct Instruction *Corrective Reading* program. Over 90 percent of the studies found positive results and only one study found greater gains with another intervention. Similar results appeared with different types of assessments (e.g. standardized tests or curriculum-based measures), in different settings, with different types of instructors (e.g. certified teachers, peers, aides), and with different research designs.

- Schieffer and colleagues (2002) reviewed 21 studies of *Reading Mastery* (RM) that compared its use to that of another program. Results in fourteen of these studies (67%) favored RM, other programs were favored in three (14%), and there were no differences in the remainder.

- Simonson and Gunter (2001) looked at 18 studies of spelling programs and found that DI spelling programs consistently demonstrated better outcomes than comparison strategies. Positive results appeared for students in general education, elementary and middle school, and for students experiencing difficulties in the area of spelling.

Recent NIFDI Research

Recent research conducted by NIFDI continues to document the effectiveness of Direct Instruction. These studies confirm the accumulated findings of decades of research showing that students taught with DI have higher achievement scores than students studying with other curricula.

- The recent positive findings for Direct Instruction occur for students in different subjects, for example, in both reading and mathematics.

- They appear in different geographic settings including urban inner cities, rural areas, suburbia, and outside the United States.

- Positive findings regarding DI appear with students with different learning histories: with middle class high achieving students, with high risk students, with general education students, and with special education students.

- Positive findings are documented for students with different racial-ethnic backgrounds: in schools that are predominantly African American, those with substantial numbers of Hispanic students and those with large numbers of non-Hispanic whites.

- Positive findings are found for elementary students as well as for preschoolers and those in middle school.

- The strong positive results appear with different types of assessments including state test scores, curriculum-based measures, and norm-referenced tests.

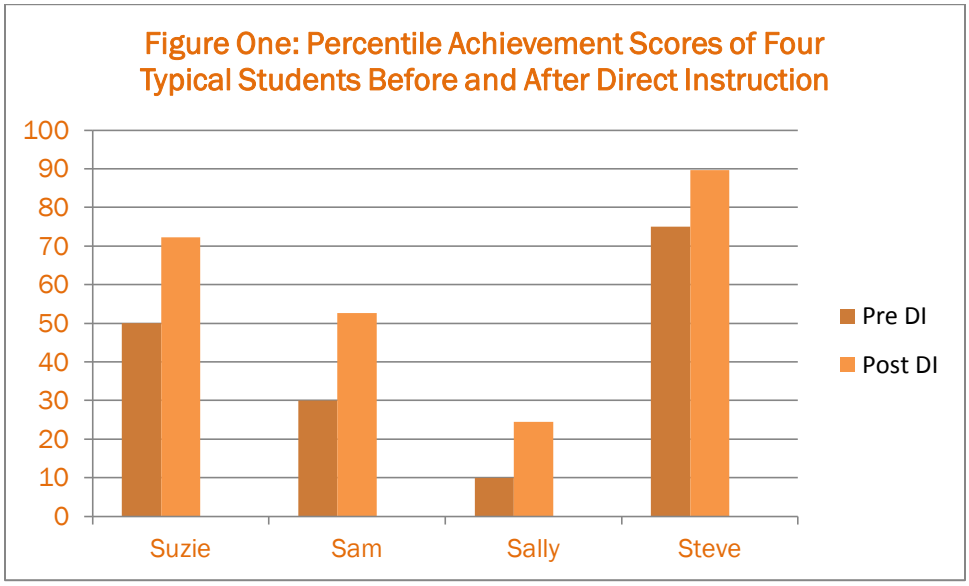
- The strong positive results occur in studies using different research designs including randomized control trials and quasi-experimental designs.

Estimating the Impact of Direct Instruction

The most extensive mathematical summary of the DI literature to date is probably the work of John Hattie (2009). He did a "meta-analysis of meta-analyses," quantitatively summarizing the results of four meta-analyses that included DI and incorporating 304 studies, 597 effects and over 42,000 students. The tradition in meta-analysis is to use "effect sizes," or the difference between groups in standard deviation units. The abbreviation "d" is generally used to estimate these standard deviation differences. Traditionally, d values have been seen as "educationally important" only if they are .25 or higher. Hattie found that the average effect size associated with DI was .59, far above this criterion. He also noted that the positive results were "similar for regular (d=.99) and special education and lower ability students (d=0.86), … [and] similar for the more low-level word-attack (d=.64) and also for high-level comprehension (d=.54)" (pp. 206-207).

Figure One below uses the average effect size reported by Hattie to project what might happen with hypothetical students if their schools implemented Direct Instruction. The first column of data (labeled Pre-DI) reports their scores on a hypothetical national achievement test. One student (Susie) is an average student, with achievement scores before the start of DI that were at the 50th percentile, exactly equal to the national average. Two students (Sam and Sally) are students who appear to have difficulties and score well below the national average. Sam is at the 30th percentile, meaning that 70 percent of the other students have higher scores

and only 30 percent have lower scores. Sally is even lower, at the 10th percentile, with 90 percent of the other students having higher scores. Steve scores above average, at the 75th percentile, with only 25 percent of the nation's students having higher scores.



The second column of data shows the scores that would be expected after implementation of DI based on Hattie's summary of over 300 studies. Suzie would be expected to move from the middle of the pack to almost the top quarter (from the 50th to the 72nd percentile). Sam would move from the bottom third to the top half (from the 30th to the 53rd percentile). Sally would still be below average, but would score much higher than her peers (moving from the 10th to the 24th percentile), and Steve would move into the top ranks (from the 75th to the 90th percentile).[1]

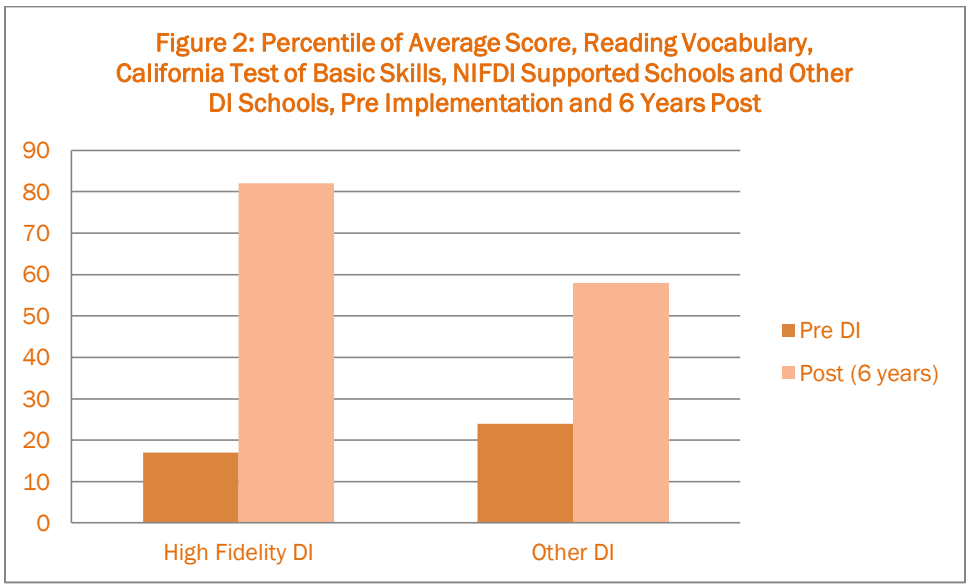
While the results in Figure One illustrate the projections with individual students, the same findings would apply to schools. A school that had test results at the national average would be expected, after the implementation of DI, to have average results above the 70th percentile. A school with average scores at the 30th percentile would be expected to move to above average.

It is important to remember that the results presented by Hattie are averages across many different studies and sites. Thus, they do not control for the fidelity of the implementation to the DI model, the extent to which the implementations conformed

[1] To calculate the projections the hypothetical starting percentiles were converted to Normal Curve Equivalent scores, which by definition have a mean of 50 and a standard deviation of 21.06. Each NCE score was increased by .59 of a standard deviation and the resulting new scores were converted back to percentiles. This procedure is necessary because, technically, percentiles cannot be used in mathematical calculations.

to all elements prescribed by the authors. The literature is clear in indicating that results are more positive when the programs are implemented as designed. Hattie's results also reflect studies with widely different time spans. The literature also shows that the positive impact of DI increases markedly as teachers learn to use the program and students have greater exposure to it.

Figure 2 summarizes results from a study that examined the impact of fidelity of implementation and length of time that schools used the program (Stockard, 2011b). One set of schools implemented DI with the support of the National Institute for Direct Instruction, which requires strong adherence to the developers' guidelines. The other schools implemented Direct Instruction with other types of technical support. The data reported are the percentiles associated with the average scores of first graders on a standardized achievement test in the year before the schools started using DI and six years after implementation started. The average achievement increased markedly over time for students in both schools. However, the increase was much greater in the schools that had high fidelity. Even though that school began with much lower scores (and had substantially higher rates of poverty) their average scores six years after implementation began were significantly higher than those in the other DI schools. (Similar results appeared with measures of Reading Comprehension.)



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Note: Copies of all material cited above are available upon request from the National Institute of Direct Instruction