

Broadening the Institutional Value of Direct Instruction Implemented in a Low-SES Elementary School: Implications for Scale-Up and School Reform

Abstract: This paper illustrates an approach for Direct Instruction (DI) practitioners and researchers for enhancing the value of DI implementations beyond that obtained through student test performance alone. The importance of such enhancements is based on perspectives from scale-up research linking intervention value with sustainability. In this study, improved reading achievement resulting from a 6-year school-wide DI intervention in a low-socio-economic status (SES) elementary school provided the setting for investigating those components that could enhance DI value. Results showed that DI teaching experience significantly increased teachers' academic expectations for low-SES students. In comparison, the academic expectations of teachers in low- and high-SES non-DI schools in judging representative DI reading content were found to underestimate the potential curricular mastery their students could accomplish. Implications for enhancing the institutional value of DI for sustain-

ability were considered within a framework of school-based scale-up dynamics.

Over the past 20 years, educational reform has had limited success in improving the educational system as a whole (Campbell, Hombro, & Mazzeo, 2000; Consortium on Productivity in the Schools, 1995; Finn, 1991; Marzano, 2003; National Assessment of Educational Progress, 2002, 2005; Snell, 2005). During this 20-year period, approaches to educational reform have reflected two disparate perspectives. The first perspective, which has been dominant in school reform, is inherently non-curricular and primarily emphasizes school organization, decision-making, and accountability (see Comprehensive School Reform Quality Center, 2005). In contrast, the second perspective, which has received minimal emphasis in school reform, is highly curricular. This curricular-oriented perspective stems from work in compensatory education that preceded the present educational reform movement and is exemplified by Project Follow Through (Adams & Engelmann, 1996; Stebbins, St. Pierre, Proper, Anderson, & Cerva, 1977). Considered as a curricular-oriented reform initiative, the objective of Project Follow Through was to ensure that the cumulative instructional content necessary for the academic success of low-SES, school-dependent students was taught effectively within school settings.

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In Project Follow Through, the DI model addressing reading comprehension, language, spelling, thinking, and mathematics was validated as uniquely effective in preparing low-SES, school-dependent, K-3 students to achieve grade-level or close-to-grade-level achievement as measured by nationally normed achievement tests across those curricular areas administered at the end of grade 3 (Adams & Engelmann, 1996; Stebbins et al., 1977). In doing so, the specific instructional goal of DI within Project Follow Through was to prepare students for future academic success in grade 4 and beyond. In comparison, the present emphasis on school reform is to meet minimal state-tested accountability standards in a short-term, grade-specific manner that minimizes the accelerated academic growth and content preparation ultimately needed by low-SES students for success in content-rich secondary courses (Hirsch, 1996, 2006; Jones et al., 1999; Vitale, Romance, & Klentschy, 2006).

Given the societal mandate for educational reform, it is surprising that the organizational and curricular reform perspectives noted above have not been combined and their systemic benefits to low-SES children studied systematically. As Project Follow Through demonstrated, low-SES, school-dependent students required a high-quality academic curriculum to accelerate the rate of cumulative academic progress needed for subsequent school success (see Lindsay, 2004; Marchand-Martella, Slocum, & Martella, 2004). In turn, implementation of such high-quality curricula with fidelity requires substantial organizational support (Engelmann & Engelmann, 2004). Logically, the implications of combining reform-dominant organizational dynamics with either the revisions of the original DI reading and thinking programs validated in Project Follow Through or other validated DI programs (see Adams & Engelmann, 1996; Marchand-Martella et al., 2004) offer opportunities for school reform that would raise achievement expectations and outcomes for all

students. Again, because the primary focus in school reform has been on improving test scores driven by state accountability systems (e.g., Florida Department of Education, 2006), the curricular focus for low-SES students has been upon relatively low-level academic tasks primarily relevant to yearly grade-specific testing outcomes rather than upon preparing students for subsequent learning success (see Dolan, 2005). As a result, rather than cumulatively raising teacher and other systemic expectations of the academic potential of low-SES (and other) students, present school reform initiatives have limited such achievement expectations by emphasizing student preparation for state accountability tests as the focus of instruction rather than focusing on the rich instructional content that students in DI programs gain as a foundation for future learning (see Kaniuka, 1997).

Insofar as the role of DI in educational reform is concerned, using student achievement assessed by state accountability measures is a necessary but not a sufficient requirement for addressing and overcoming the barriers to sustaining DI interventions in school reform settings (see Engelmann & Engelmann, 2004). In this regard, an area of investigation that is directly relevant to broadening the role of DI in reform initiatives has evolved from investigations that have focused on school-based initiations of research-validated instructional interventions that, over time, have not been sustained (e.g., Dede, Honan, & Peters, 2005; Glennan, Bodilly, Galegher, & Kerr, 2004; Schneider & McDonald, 2006a, 2006b). Studied under the general topic of scale-up, recent analyses (Bodilly, Glennan, Kerr, & Galegher, 2004; Constan & Brown, 2007; Engelmann & Engelmann) have furthered an understanding of the dynamics for the initiation, sustainability, and subsequent expansion of school-based implementations of research-validated approaches to instruction.

In expanding major elements of recent work on scale-up, Vitale and Romance (2004, 2005)

developed a practitioner-oriented scale-up model (see also Romance & Vitale, 2005, 2007). In their model, Vitale and Romance applied reverse-engineered instructional-systems design principles (see Dick, Cary, & Cary, 2004) to explicate the key technical elements of organizational infrastructure and capacity development that are necessary for scale-up (i.e., initiation, sustainability, subsequent expansion) in a form that is applicable to any instructional intervention, including the use of DI.

In addition to specifying technical implementation components for scale-up, Vitale and Romance (2004, 2005) also addressed how transferring implementation responsibility to school/district personnel in conjunction with establishing the systemic value added to the educational institution by the intervention are critical requirements for sustainability. In their scale-up model, the question of how to construct and disseminate the different forms of institutional value enhanced by an instructional intervention is considered a key issue for ensuring the sustainability of that intervention. More specifically, with regard to DI, the Vitale and Romance scale-up model suggests that if the wide variety of rich instructional (and other) outcomes resulting from sound DI interventions cannot be identified and communicated in a manner that first addresses and then, eventually, raises established institutional values, then the potential sustainability of such DI interventions is very limited (cf. Engelmann & Engelmann, 2004). In the absence of value-added perspectives, improved test scores alone have not been sufficient to sustain (and expand) DI implementations in many applied school settings.

The purpose of this study was to illustrate the potential power of an approach that could be applied by DI practitioners and researchers to broaden the value of any DI implementation beyond that obtained through student test performance alone. The setting for the study was a low-SES elementary school that imple-

mented DI on a school-wide basis over a 6-year period. Therefore, the primary goal of the study was not to document the positive effects of DI itself in improving student achievement. Rather, in the study, improved achievement resulting from DI provided a valid context for identifying and interpreting the perspectives of DI teachers and of teachers in non-DI schools with regard to student achievement expectations associated with DI that had the potential to establish the added value of DI within the school-based reform initiative.

Following a design that incorporated three complementary parts, the study documented and related (a) the longitudinal reading achievement outcomes reflecting the implementation of DI in a low-SES elementary school as measured by a state-administered accountability test, (b) the perceived changes in student academic expectations reported by teachers and teaching assistants using DI, and (c) the academic expectations of teachers using traditional curriculum in low- and high-SES non-DI schools in the form of judgments of the proficiency of their students on representative curricular components of the major DI reading program used.

In considering these three parts together, the point of this study was to obtain a pattern of data in a form that, if communicated, could have the potential to enhance the institutional value of DI with regard to the following general question: Is there consensus from a variety of evaluative evidence supporting the conclusion that the DI implementation accelerated the achievement of a low-SES student population to a level that exceeded that of students in both low- and high-SES non-DI schools? If obtained, the enhancement of such student achievement outcomes, coupled with associated teacher achievement expectations, could have important implications for enhancing the institutional value of any DI programs within a school reform context.

Method

Participants

Complementary groups of participants from two research settings comprised this study: (a) teachers (and student achievement data) in a low-SES elementary school using DI and (b) teachers in two high-SES and two low-SES non-DI elementary schools.

Low-SES elementary school using DI. The primary setting for the study was a low-SES elementary school located in a predominantly rural school district in north-central North Carolina. The town where the school was located had a population of 18,000. Because it was located halfway between New York and Florida off of two major highways, drug trafficking in the town was a significant problem. Such drug-related activities engendered other crimes including a homicide rate that was one of the highest in the state. The per capita median income in the county was \$20,168, and the county had the highest number of residents per capita living in mobile homes in the state. The unemployment rate was the highest in the state, typically fluctuating between 13.5% and 15.5%. Most of the students in the school district came from single-parent homes headed by females. The teen pregnancy rate between the ages of 15 and 19 was the highest in the state and was linked directly to a high dropout rate.

The low-SES elementary school had a grade range of pre-K–5 and approximately 400 students. The student population was 98% minority, with 98% of students receiving either free or reduced-price lunch. The typical yearly student mobility rate was 40%, with many upper-grade students, grades 4-5 in particular, entering, leaving, and re-entering the school multiple times within the same school year.

During the 1996-97 school year preceding the school-wide implementation of DI, the school was identified as one of the lowest-performing schools in the state, with only 23% of the stu-

dents performing at or above grade level in reading and mathematics (including none of the students in demonstrating writing proficiency) as assessed by state-administered accountability tests. As a result, the school was assigned a state-mandated technical assistance team for the following school year. All teachers and teaching assistants in the school during the 2002-03 school year participated in the DI survey component of the study because each taught at least one DI program within the school-wide DI reform initiative.

Low- and high-SES non-DI schools. The other participants in the study consisted of all K-5 teachers from two high-SES and two low-SES non-DI schools located in the same or in a neighboring school district. The two low-SES non-DI schools were predominantly minority, with high percentages of students eligible for free or reduced-price lunch (73% and 85%, respectively), while the two high-SES non-DI schools had student populations that were predominantly Caucasian, with relatively few students eligible for free or reduced-price lunch (5% and 15%, respectively). All of the non-DI schools had lower mobility rates than that of the low-SES DI school, with the mobility rates for the two low-SES and two high-SES non-DI schools being 10% and 25%, and 5% and 15%, respectively.

Instruments

Three forms of instrumentation used in this study assessed (a) student reading proficiency, (b) perceived changes in student achievement expectations by DI teachers, and (c) achievement expectations of non-DI students by non-DI teachers on selected DI curricular components.

Student reading assessment. Student reading achievement was assessed by the North Carolina End-of-Grade Reading Comprehension Test (NC-EOG Reading) developed and administered as part of the state accountability system in grades 3-5

(North Carolina Division of Accountability Services, 2006). Scores on the NC-EOG Reading test are reported by the state in the form of developmental scale scores, along with state-established student proficiency (i.e., mastery) levels for each grade level.

Perceived changes in student achievement expectations by DI teachers. The changes in achievement expectations of 2002-03 DI teachers and teaching assistants in the low-SES DI school were assessed by a 17-item survey instrument, the Teacher Questionnaire (TQ), constructed by the authors. Each of the 17 TQ items presented a different facet of possible academic performance expectations that teachers could have for their students (e.g., “Students consistently display learning progress every day,” “I can readily see the retention of skills previously taught.”). The teachers (or teaching assistants) indicated their agreement or disagreement to each item using a 4-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree) in two different ways. First, teachers responded to each item based on their present experiences in teaching DI. Second, teachers responded to each item based on what their expectations were prior to teaching DI. For purposes of reporting and analysis, the 4-point Likert scale was linearly transformed into a 100-point scale (0-99) representing percentage of maximum agreement (e.g., 1 = 0%, 2 = 33%, 3 = 66%, 4 = 99%). All teachers and teaching assistants who used DI programs completed the survey on an anonymous basis.

Judged achievement expectations of non-DI students by non-DI teachers. In the four non-DI schools, the achievement expectations of the teachers on representative DI excerpts (i.e., reading passages) were assessed using the *Student Activity Analysis Form (SAAF)* developed and validated by Kaniuka (1997) and Vitale, Boldt, Kaniuka, and Scott (1999). The *SAAF* presented teachers in non-DI schools with excerpts of representative reading passages from the *DI Reading Mastery (RM)* program

(Engelmann & Brunner, 1995). For each *SAAF* passage, teachers made judgments about the performance of students on the DI reading passages in grades pre-K, K, 1, 2, 3, 4, and 5 regarding (a) the percentage of their students who would be able to read a passage successfully with comprehension and (b) the grade-level appropriateness of the reading passage for high-, average-, and low-ability students in their school.

The specific DI reading passages teachers judged on the *SAAF* were selected through a stratified random sampling procedure from Levels I, II, III, and IV of the *RM* program used at the school. Teacher judgments in this portion of the study were limited to the first four *RM* levels because these represented the K-3 developmental DI sequence that was the focus of the study as implemented in the low-SES school. The high mobility rate in the upper grades resulted in many students receiving combinations of *Corrective Reading (CR)* (Engelmann, Carnine, & Johnson, 1999) and *RM* in the overall DI implementation. Table 1 shows the *RM* levels, lesson numbers, and word length for the reading passage excerpts used for the *SAAF*. All teachers in the non-DI schools completed the *SAAF* survey on an anonymous basis.

School-wide DI Implementation Plan

The overall instructional plan for reading in the low-SES DI school was to implement the *RM* 6-level developmental reading program on a school-wide basis as follows: *RM-I* in kindergarten; *RM-II* in grade 1; *RM-III* in grade 2, and *RM-IV* in grade 3. Upon finishing *RM-IV* in grade 3 (or 4), students were assigned to *RM-V* and *RM-VI*. By design, *RM-I* and *RM-II* focus on decoding fluency and literal comprehension, *RM-III* and *RM-IV* focus on content-area reading and emphasize science, and *RM-V* and *RM-VI* focus on literature.

Complementing *RM*, a DI developmental thinking program called *Language for Learning*

(*LL*) (Engelmann & Osborn, 1999) was implemented school-wide as a 1-year instructional component that was completed at the pre-K level for students enrolled in the low-SES DI school. Students who were not enrolled for the majority of the year at the pre-K level or new to the school at the K-level completed *LL* prior to the end of kindergarten.

In addition to *RM*, the *CR* program also was used in the school for the remediation of students in grades 3, 4, and 5 who transferred into the school until they could be placed in appropriate levels of *RM*, the core developmental reading program at the school. Because of the high mobility rate of grade 4 and 5 students, the majority remained in *CR*. Although the overall school-wide DI instructional program that impacted school achievement included *RM*, *LL*, and *CR*, the focus of this study was on elements having the potential to add value to the overall effect of DI as a whole through the implementation of *RM* as the core developmental DI reading program.

The implementation of all DI programs followed standard program guidelines (e.g., teacher professional development with follow-up support, use of program placement and curriculum-based tests, emphasis on mastery learning, monitoring/management by the principal assisted by a part-time DI coordinator) in a manner consistent with recommendations by Crawford (2003) and Silbert (2001).

Design, Analysis, and Procedure

Part 1 of the study focused on the effects of the 6-year reform initiative at the low-SES elementary school that implemented DI reading (*RM* in grades K-3, *RM* or *CR* in grades 3-5) and thinking programs (*LL* in pre-K, K). The purpose of part 1 was to demonstrate that the school-wide implementation of DI was both accelerated (i.e., the initiation of *RM-I* in kindergarten) and effective in a manner that provided a credible methodological context for parts 2 and 3 of the study. Data for part 1 consisted of (a) the overall achievement outcomes of the school on the *NC-EOG Reading* test

Table 1

*Level and Lesson Number of Reading Passages from Reading Mastery (RM)
Rated by Teachers in Non-Direct Instruction Schools
on the Student Activity Analysis Form (SAAF)*

Passage Title	Words in SAAF	Program	Lesson	Cumulative RM Lesson	Grade-Level Assignment
Red Hat	89	RM-I	125	125	K
Old Man	130	RM-I	150	150	K
Magic Pouch	150	RM-II	51	211	1
Van and the Vane	288	RM-II	127	287	1
Nancy Gets Some Water	330	RM-III	38	358	2
How Horses Changed	364	RM-III	106	426	2
Another Problem	308	RM-IV	48	528	3
Al Learns About Molecules	385	RM-IV	110	590	3

Note. *Reading Mastery (RM)* program orthography was standardized for *RM-I* Lesson 125, *RM-I* Lesson 150, and *RM-II* Lesson 51.

(reflecting the overall DI implementation) and (b) records of student progress through the DI *RM* program (K-5) linked to student achievement on the *NC-EOG Reading* test (reflecting the implementation of *RM*).

Given part 1, part 2 of the study surveyed the degree to which the academic expectations of the 2002-03 DI teachers and teaching assistants changed prior to and after using DI. Data for part 2 consisted of teacher responses to the *TQ* survey designed to assess perceived changes in teacher expectations of student academic performance before and after using DI at the low-SES school. The *TQ* was administered at the end of the 2002-03 school year.

Given parts 1 and 2, part 3 of the study assessed the academic expectations of teachers in the high- and low-SES non-DI schools on the representative passages from *RM* (Levels I, II, III, and IV). Data for part 3 consisted of judgments by K-5 teachers in the two low-SES and the two high-SES non-DI schools on the *SAAF* regarding the grade-level appropriateness and estimated percentage of their students who would display mastery on the specific DI reading passages selected (see 1).

The selection of the participating schools for part 3 followed a stratified random sampling procedure. Schools from the two cooperating districts were grouped into high- and low-SES categories (percentage of students receiving free or reduced-price lunch) and by 2001-02 *NC-EOG-Reading* achievement levels and two schools selected randomly from each group. The low-SES non-DI schools were selected from those whose 2001-02 *NC-EOG Reading* achievement matched that of the low-SES DI school. The low-SES non-DI schools' reading proficiency levels were 63% and 64%, while the low-SES DI school reading proficiency level was 65%. The high-SES non-DI schools were selected from those with high *NC-EOG Reading* achievement proficiency (75%, 84%). The principals for each school selected were

contacted to obtain their approval and agreed to participate.

Teachers completed the *SAAF* in three of the four non-DI schools in mid-August 2002 through early September 2002 (prior to the beginning of the 2002-03 school year) during staff meetings supervised by the principal and the authors. Because the fourth school followed a year-long schedule, the *SAAF* was administered in June 2002, the approximate date marking the end of the traditional 2001-02 school year but before the beginning of the traditional 2002-03 school year. In the fourth school, the principal presented the instructions to teachers before distributing the forms and then collected the returned forms over a 5-day period. The *SAAF* instructions to teachers in all four schools emphasized that they were to focus on their experiences during the preceding (2001-02) school year.

The findings for part 3 were summarized by computing mean responses for passages by grade by school. In addition, separate ANOVAs were used to analyze the judgments of teachers on percentage of student mastery on and grade-level appropriateness of the reading passages. For the estimates of student reading passage mastery by non-DI teachers, a three-factor $2 \times 8 \times 7$ ANOVA (School SES Level: High, Low; Passage, Grade: pre-K, K, 1, 2, 3, 4, 5) with repeated measures on the third factor was conducted. A parallel three-factor $2 \times 8 \times 3$ ANOVA was used for analysis of non-DI teacher-reported grade-level-appropriate data.

Results

Part 1: School-wide Implementation of DI as a Context for the Study

Table 2 summarizes the student achievement trends at the low-SES DI school prior to and after the initiation of the school-wide DI implementation in mid-year, 1997-98. As Table 2 shows, the school-wide DI implementation was highly effective, with the percentage of

students scoring at or above grade-level proficiency on the *NC-EOG Reading* test increasing from 24% (pre-DI) to 70.8% over a 7-year period, a substantial performance improvement. In inspecting Table 2, it is important to note that the actual trend in improved student achievement required a 3- to 4-year time period to emerge. Presumably, during this time the initial low levels of prior student achievement progress were accelerated and teacher effectiveness in using DI improved. With this emerging achievement pattern, an evaluation of the effectiveness of DI based on the initial years of implementation would have reached a different conclusion than an evaluation conducted over the entire implementation period (see Engelmann & Engelmann, 2004).

Table 3 shows the end-of-year status for each of the instructional groups of K-5 students using *RM*. In inspecting Table 3, it is important to recognize that within the small-group DI instructional framework, student groups may display faster or slower rates of progress, depending upon the amount of practice they require to master the skills to be learned. Thus, using a rate of one lesson per day as an informal guide, the implementation of *RM* across grade levels summarized in Table 3

should be considered to be substantially accelerated across grades K-3 (vs. beginning *RM-I* in grade 1). Again, the relatively low numbers of *RM* students shown in grades 4-5 is due to the large numbers of students entering, leaving, and re-entering the school during the school year. Since the focus of this part of the study was only on students completing Levels I through IV of the *RM* program in a sequential order across grades, students in upper grade levels who received combinations of *RM* and *CR* are not included in Table 3.

Table 4 shows the percentage of students performing at or above grade level on the *NC-EOG Reading* test as a function of the cumulative number of lessons completed by students in *RM* as implemented at the low-SES school. As Table 4 shows, virtually all students in *RM* for grades 3-5 scored at or above grade level on the *NC-EOG Reading* test. In fact, referring to Tables 3 and 4 together, one instructional group of grade 2 students ($n = 17$) who had been accelerated through *RM* in grades K-1 reached Lesson 98 of *RM-IV*, a high level of achievement. In general, students who received *RM* displayed a high level of progress.

Table 2

Percentage of Students At or Above Grade Level Proficiency in Reading at the Low-SES Direct Instruction School as Measured by the North Carolina End-of-Grade Reading Tests

Grade	School Year						
	96-97	97-98 ^a	98-99	99-00	00-01	01-02	02-03
3	28.6	44.7	32.8	38.2	50.0	70.6	66.1
4	20.0	23.9	44.4	31.0	39.6	58.4	76.6
5	23.4	38.9	34.6	66.7	61.5	66.1	69.8
Mean	24.0	35.8	37.2	45.3	50.3	65.0	70.8

^a The school-wide DI initiative was initiated in mid-year 1997-98. The first full year of the school-wide DI initiative was 1998-99.

Table 3

*Number of Students at End-of-Year Reading Mastery (RM) Levels/Lessons
at the Low-SES Direct Instruction School*

RM Level	RM Lesson	Cumulative Lessons	Grade					
			K	1	2	3	4	5
RM I	128	128	8					
RM I	143	143	4					
RM I	150	150	10					
RM I	153	153	24					
RM I	160	160	17					
RM II	23	183		5				
RM II	84	244	5	6				
RM II	120	280		11	2			
RM II	155	315		10				
RM III	27	342		8	3			
RM III	46	361		8				
RM III	47	362		8	3			
RM III	74	389			9			
RM III	130	445			12			
RM III	140	455			15			
RM IV	83	538				31		
RM IV	98	553			17			
RM IV	120	575					23	
RM IV	140	595					18	
RM V	52	647				3		8

Note 1. Grade 3-5 *Reading Mastery (RM)* placements are for 2001-02. K-2 *RM* placements are for 2003-04 (2001-02 placement records were not complete for K-2 *RM*, so the most recent placement levels were used). Table 3 only includes students placing in *RM*. Students (typically those entering or reentering the school) who did not place in *RM* were enrolled in a remedial Direct Instruction program, *Corrective Reading*.

Note 2. Because the instructional implementation is highly interactive and supervision includes continuous monitoring of individual student performance through curriculum-based tests, student placement implies cumulative mastery of curriculum content through lessons completed.

Part 2: Changes of Academic Performance Expectations of DI Teachers and Teaching Assistants at the Low-SES School

Table 5 summarizes the changes in the academic performance expectations reported by the DI teachers and teaching assistants prior to and after their experiences using DI. As Table 5 shows, prior to using DI the level of agreement of teachers and teaching assistants with the *TQ* statements, which indicated positive performance expectations for their predominantly low-SES students, ranged from 53% to 60% (mean = 58%). One interpretation of these numeric values is that teachers were split relative to agreement versus disagreement with statements of positive academic expectations. However, as Table 5 shows, after their experiences using DI, the degree of agreement of DI teachers with positive student academic expectations was higher and very positive (mean = 80%), representing a statistically significant mean increase of +22%, $t(26) = 6.77, p > .001$. Inspecting Table 5, it also is important to note that positive before–after changes reported by teachers were found for all of the survey items.

Part 3: Academic Expectations of Teachers in High- and Low-SES non-DI Schools of Their Students on DI Reading Passages Used at the Low-SES DI School

Table 6 summarizes teacher estimates of the percentage of students at each grade level in the high- and low-SES non-DI schools that, if tested, would demonstrate mastery on each of the specified passages from *RM*. As Table 6 shows, teachers judged that very few of their kindergarten students (14.4% and 6.6% at the high-SES schools, 8.0% and 3.3% at the low-SES schools) would be able to read the passages selected from *RM-I*, Lessons 125 and 150, which were mastered by the majority of kindergarten students at the low-SES DI school. In addition, teachers also estimated that only 56.8% and 40.5% of grade 1 students at the high-SES non-DI schools and 47.1% and 31.4% of grade 1 students at the low-SES non-DI schools would be able to read the same passages that, again, were mastered by the kindergarten students at the DI school.

In statistically analyzing the obtained teacher judgments of student mastery, a 2 x 8 x 7 ANOVA (School SES Level: High, Low; Passage; Grade: pre-K, kindergarten, Grade 1,

Table 4

Percentage of Students at the Low-SES Direct Instruction School Who Were At or Above Grade Level Proficiency on North Carolina End-of-Grade Reading Tests as a Function of End-of-Year Placement in Reading Mastery (RM)

RM Level	RM Lesson	Cumulative Lessons	Grade		
			3	4	5
RM IV	83	538	100		
RM IV	120	575		100	
RM IV	140	595		89	
RM V	52	647	100		100

Table 5*Student Academic Performance Expectations of Direct Instruction Teachers Before and After Using Direct Instruction at the Low-SES DI School*

Student Academic Performance Statement	Before DI	After DI	After–Before Difference
1. In reading/language class, students use most of what they have previously learned.	60	80	+20
2. The instructional reading/language program used makes a big difference for students.	60	87	+27
3. The rate of progress for student learning is very high.	53	83	+30
4. My reading/language class keeps getting better during the school year.	60	87	+27
5. I wish more students could use the program I am using.	60	87	+27
6. I can see how students have increased their confidence through success.	67	87	+20
7. Students consistently display learning progress every day.	60	80	+20
8. Students are excited about reading/language instruction.	60	83	+23
9. I can readily see the retention of skills previously taught.	60	80	+20
10. My students' progress is often much better than I expect.	57	70	+13
11. I am impressed with the vocabulary students are learning.	57	77	+20
12. I have noticed that student feelings of helplessness are gone and they are more confident in learning.	57	77	+20
13. The instructional program used gives students an opportunity for repeated success while expanding their knowledge.	57	87	+30
14. Students typically work hard and try hard.	63	83	+20
15. My students consistently pass classroom or mastery tests.	53	80	+27
16. Students are amazed at how much they have been learning.	57	77	+20
17. Students are never restless or inattentive during reading/ language arts instruction.	50	60	+10

Note Score values were transformed for ease of interpretation from a 4-3-2-1 scale to a 99-66-33-0 percentage of maximum response scale. A paired *t*-test found a significant difference between the before– and after–Direct Instruction ratings of Direct Instruction teachers at the low-SES DI school, $t(26) = 6.77, p > .001$.

2, 3, 4, and 5) with repeated measures on the third factor was conducted. The results of the analysis found that (a) high-SES non-DI schools reported significantly greater percentages of teacher-estimated student mastery of the DI passages than low-SES non-DI schools, $F(1, 471) = 21.02, p < .001$, and (b) there were significant interactions between School SES Level and Grade, $F(6, 2826) = 5.39, p < .001$, and Passage and Grade, $F(42, 2826) = 30.31, p < .001$, on teacher-estimated student mastery across the DI passages. Although the main effects of Passage and Grade were also statistically significant, these findings were not of interest to the present study. No other effects were statistically significant.

Inspection of Table 6 shows that the differences between the teacher judgments of expected student mastery in the high-SES versus low-SES non-DI schools increased with grade level (illustrating the nature of the significant interaction between School SES Level and Grade reported above), as there were only minimal differences between low- and high-SES non-DI schools at lower grades. However, beginning with grade 2 the differences in expected mastery showed a consistent increase.

Table 7 summarizes the judgments of teachers in the high- and low-SES non-DI schools regarding the grade-level appropriateness of each representative passage from the DI

Table 6
Teacher Judgments of the Percentage of Student Mastery of DI Reading Passages for High- and Low-SES Non-DI Schools

School Level	RM Level	RM Lesson	Cum. Lesson	Grade						
				pre-K	K	1	2	3	4	5
High	RM I	125	125	1.5	14.4	56.8	81.7	93.0	98.1	98.9
	RM I	150	150	0.8	6.6	40.5	68.4	84.7	95.5	98.2
	RM II	51	211	0.0	1.5	18.9	51.4	74.4	86.1	95.1
	RM II	127	287	0.0	0.6	7.0	40.1	61.9	77.0	88.6
	RM III	38	358	0.0	0.0	1.5	18.2	44.2	61.2	79.7
	RM III	106	426	0.0	0.0	0.0	4.6	25.3	51.3	69.8
	RM IV	48	528	0.0	0.1	0.4	11.2	35.5	57.0	80.1
	RM IV	110	590	0.0	0.1	0.4	3.1	18.8	49.0	73.3
			Mean	0.3	2.9	15.7	34.8	54.7	71.9	85.5
Low	RM I	125	125	0.1	8.0	47.1	75.4	86.4	91.7	96.5
	RM I	150	150	0.0	3.3	31.4	56.3	73.2	86.5	94.6
	RM II	51	211	0.0	0.6	16.1	45.6	69.3	83.8	91.6
	RM II	127	287	0.0	0.1	4.9	23.3	52.2	69.2	85.6
	RM III	38	358	0.0	0.0	2.3	13.8	36.3	59.1	80.5
	RM III	106	426	0.0	0.0	0.7	6.0	15.6	35.4	59.8
	RM IV	48	528	0.0	0.1	1.3	5.8	17.3	34.7	56.0
	RM IV	110	590	0.0	0.0	0.6	5.0	13.7	31.4	47.6
			Mean	0.0	1.5	13.1	28.9	45.5	61.5	76.5

Reading Mastery program for low-, average- and high-ability students. As Table 7 shows, the grade-appropriate level for the end-of-year *RM I*, Lesson 150 passage was judged by teachers in high-SES non-DI schools as 2.9, 2.3, and 1.7 for their low-, average-, and high-ability students, respectively, and by teachers in low-SES non-DI schools as 3.2, 2.2, and 1.5 for their low-, average-, and high-ability students, respectively. Referencing the DI lesson progress in the DI school summarized in Table 3, teacher judgments in both non-DI schools represented achievement expectations below those achieved by the 82% of students in the low-SES DI school who completed or exceeded *RM I*, Lesson 150 in kindergarten.

Another important finding shown in Table 7 is that although the grade-level appropriateness of the *Reading Mastery* passages judged by teachers in the high- and low-SES non-DI schools was similar for their low-, average-, and high-ability students for lower levels of *Reading Mastery* passages, these smaller initial differences were magnified for more advanced passages. For example, for low-ability students, teachers in high-SES schools judged the grade-level appropriateness of the *RM I*, Lesson 150 passage as 2.9 and teachers in low-SES schools as 3.2, a difference of .3 years. However, for the most advanced DI passage rated for low-ability students (*RM IV*, Lesson 110), teachers in high-SES schools judged the grade appropriate-

Table 7
Teacher Judgments of the Grade-Level Appropriateness of DI Reading Passages for Low-, Average-, and High-Ability Students in High- and Low-SES Non-DI Schools

School SES	RM Level	RM Lesson	Cumulative Lesson	Student Ability Level		
				Low	Average	High
High	RM I	125	125	2.2	1.6	1.2
	RM I	150	150	2.9	2.3	1.7
	RM II	51	211	3.7	3.1	2.3
	RM II	127	287	4.3	3.5	2.9
	RM III	38	358	4.9	4.0	3.3
	RM III	106	426	5.8	4.7	3.9
	RM IV	48	528	5.0	4.4	3.6
	RM IV	110	590	6.1	5.2	4.5
			Mean	4.4	3.6	2.9
Low	RM I	125	125	2.5	1.8	1.0
	RM I	150	150	3.2	2.2	1.5
	RM II	51	211	3.8	2.9	2.1
	RM II	127	287	4.6	3.6	2.8
	RM III	38	358	5.2	4.2	3.3
	RM III	106	426	6.4	5.4	4.6
	RM IV	48	528	6.3	5.2	4.4
	RM IV	110	590	7.1	6.1	5.2
			Mean	4.9	3.9	3.1

ness of the passage as 6.1 and teachers in low-SES schools as 7.1, a difference of one full year.

In statistically analyzing the teacher judgments of the grade-level appropriateness of the DI *RM* passages, a $2 \times 8 \times 3$ ANOVA (School SES Level: High, Low; Passage; Student Ability: Low, Average, High) with repeated measures on the third factor was conducted. The results of the analysis found that (a) passage grade-level appropriateness for low-SES non-DI schools was judged significantly higher, $F(1, 743) = 29.61, p < .001$, than for high-SES non-DI schools and (b) there were significant interactions between School SES Level and Passage $F(7,743) = 4.18, p < .001$, School SES Level and Student Ability $F(2, 1486) = 11.69, p < .001$, and Passage and Student Ability $F(14, 1486) = 4.65, p < .001$ on the judged grade-level appropriateness across the DI passages. Although the main effects of Passage and Student Ability also were statistically significant, these findings were not of interest to the present study. No other effects were statistically significant.

Amplifying the preceding statistical results, inspection of Table 7 shows the differences in judgments of grade-level appropriateness by teachers in the high- and low-SES non-DI schools were greater for low-ability students, with teachers in low-SES non-DI schools rating the passages as far more advanced (i.e., as having higher grade-level appropriateness). Also shown in Table 7 is that differences in grade-level appropriateness between average- and high-ability students was greater for more advanced *Reading Mastery* passages (*RM III*, Lesson 106, *RM IV* Lessons 48 and 110).

Discussion

The pattern of findings obtained in parts 1, 2, and 3 have implications that are of substantial importance to any systemic reform initiative involving DI. It appears that the school-wide

implementation of the overall DI instructional plan involving *RM* and *LL* (and complemented by *CR*) resulted in a high level of reading achievement as measured by the state-administered *NC-EOG Reading* test. This finding was important because without impacting student achievement on high-stakes accountability tests, the DI implementation would not have had credibility for the school or district.

In addition to the positive impact on student achievement, the other complementary outcomes obtained provide additional support for the potential value of DI to the school and district. Specifically, this study found that the achievement expectations of teachers in non-DI schools implementing district-adopted basal reading curricula significantly underestimated both the level and rate of student reading proficiency that could be accomplished by using DI with all students. As suggested by Vitale and Romance (Romance & Vitale, 2005, 2007; Vitale & Romance, 2004, 2005), the identification and communication of these teacher achievement judgments of the performance of their students on DI curricular content provides an additional aspect of the systemic value of DI that has important implications for sustainability and expansion beyond that of reading test achievement alone.

Of even greater potential for enhancing the systemic value of DI to schools engaged in reform is the finding that the underestimates of student achievement expectations obtained from non-DI teachers were greater both for low-SES and low-ability students and for higher levels of academic content. Based on this pattern of teacher judgments, an argument advocating the expanded use of DI *RM* could emphasize the expectation of positive school improvement outcomes that presently are blocked by advocates of traditional non-DI reading curriculum by schools. In addition, these teacher judgment data as a form of value provide evidence that implementing DI more widely would enhance the quality of the educational environment and that withholding DI

from students would severely limit their expected rate of achievement. Consistent with the preceding, this study also showed that the use of DI by teachers significantly raised their achievement expectations with regard to what low-SES students could accomplish within school learning settings, another important outcome for furthering educational reform.

In considering the overall implications for educational reform based on combining parts 1, 2 and 3 of the study (i.e., reviewing Tables 5, 6, and 7), the data obtained in the present study provide a pattern of evidence not only that the use of DI would significantly improve instructional outcomes of schools, but also that the effective use of DI by teachers would ensure a parallel increase in achievement expectations that, in turn, potentially could strengthen ongoing reform processes (see Snider & Schumitsch, 2006). In support of the development of an advocacy initiative whose foundation is broader than achievement outcomes alone, the chances of sustaining and expanding the use of DI would be enhanced by identifying the variety of ways in which the value of DI could be recognized and supported in a manner that has implications for district instructional policy (Colburn, 2001). And, it is important to note that such enhanced value is in addition to that engendered through achievement test outcomes alone.

Having information to use and making effective use of information within an educational system are two different things. Effective use of the type of information obtained in the present study as a means for enhancing the value of a DI implementation would involve establishing a multi-faceted communication network. Beyond making such patterns of information available to district decision-makers as a means of guiding school reform, the information also could be communicated to parents and to school board members as a means of building advocacy for sustaining DI. In communicating the educational benefits of DI to parents, DI reading passages (or content

from any DI program) sampled over time would clearly show what children are doing presently in school and what children could be expected to be learning in the future. For school board members (and central school administrators), comparisons of DI content samples across instructional days (such as used in the present study) with those from basal (or other traditional) curriculum materials also can be presented in conjunction with the forms of teacher perspectives obtained in the present study. Our clinical experience has been that such comparisons between DI and non-DI traditional content have a positive impact on the student achievement expectations held by both educators and non-educators alike.

Although the preceding is illustrative of how DI content samples and teacher perspectives could be used as information sources for enhancing the value of DI implementations, some other important forms of information should be noted as well. One such complementary form of information is the relationship between student achievement (e.g., grade equivalents, developmental scale scores) on assessment instruments (e.g., reading tests) as a function of student location (i.e., cumulative lesson placement) in a DI program (e.g., *RM*). Consistent with the results shown in Tables 3 and 4, our experience (e.g., Vitale et al., 1999) has been that such relationships between DI instructional level (cumulative lesson placement) and achievement test outcomes tend to be linear. As a result, with such information displays, the implications of student placement in and expected lesson-by-lesson progress through any DI program can be communicated as a means of establishing (and obtaining) increased student achievement expectations. Within such an operational framework, both DI content samples and associated student achievement test outcomes can be linked to such lesson sequences (Vitale et al.). Because this information is readily available to DI practitioners and researchers (e.g., student lesson when tested, student test

achievement), such forms of information display can be constructed for any DI program.

The final form of information considered here is more difficult to obtain but very important in building systemic perspectives for broadening the value of DI in elementary grades. This information source consists of cohort studies that link student performance in the elementary grades with their subsequent levels of achievement success in high school. Although not addressed in the present study, such research investigations are necessary to communicate the implications of the rich academic content students gain from DI programs that provide a sound, cumulative foundation for future learning. For example, in a longitudinal study, Dolan (2005) found that the actual level of achievement on state-administered reading tests in the upper elementary grades that was predictive of subsequent on-grade-level achievement in grade 10 was, in reality, much higher than the levels of achievement set by the state as indicating reading proficiency at those grade levels. In effect, Dolan found that the standards for successful achievement set by the state at the upper elementary levels for accountability purposes systematically overestimated their contribution to future student learning success.

The potential implication for adding to the recognized value of DI that remains to be demonstrated through future research is whether student mastery of the additional learning content in DI (e.g., the content comprising *RM-III* and *RM-IV*) that is not measured by state accountability reading tests or whether the academic acceleration obtained through DI (such as in the present study) is predictive of higher levels of subsequent student academic performance at the high school level (see related work by Gersten, Keating, & Becker, 1988). If established through future research, such information would provide evidence of an important form of value added by DI that could be used by district decision-makers engaged in setting educational reform priorities.

Reflecting the limitations of a single study, the findings presented here address an important curricular issue within the school reform process regarding the extent to which achievement expectations of teachers embedded in state-mandated reform substantially underestimate student potential mastery and rate of mastery of advanced instructional content. In particular, such findings, if replicated through future research, have important implications for low-SES, at-risk students who depend on school for learning. Within this framework, the findings of the study are suggestive of important reform issues that, if addressed and communicated effectively, could increase the value of DI to school systems working to improve student achievement.

In considering research issues raised in the present study, it is important to recognize that combining the DI literature that has emphasized DI implementation requirements (e.g., Engelmann & Engelmann, 2004) with perspectives from scale-up research that have addressed the problem of sustainability (e.g., Bodilly et al., 2004; Constanas & Brown, 2007; Dede et al., 2005; Glennan et al., 2004; Schneider & McDonald, 2006a, 2006b) has significant potential for advancing the role of DI in educational reform. In this regard, amplifying the many facets of sound DI implementations that add to the value of educational institutions engaged in reform to establish a continuing commitment to DI should be a major objective of researchers and practitioners alike (see Romance & Vitale, 2005, 2007; Vitale & Romance, 2004, 2005). While improved student achievement provides the foundational value of any instructional intervention, it is important that DI practitioners and researchers begin to take advantage of the additional outcomes associated with effective use of DI, including those involving teacher perspectives and longitudinal achievement growth, to strengthen the scope of institutional value that may be necessary for any DI implementation to be sustained (see Grossman, 2005).

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