SMALLER
LEARNING COMMUNITIES
PROGRAM

The Correlates of Middle School Teachers' Professional Development Implementation, Instructional Beliefs, and Student Reading Achievement

Kelly Feighan
Elizabeth Heeren
Jill Feldman

Research for Better Schools

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Introduction

The national conversation about retaining and rewarding effective K–12 teachers raises important questions about how to measure the impact of professional development on teacher practice and student learning. How do school leaders determine whether an intervention contributed to improvements in teaching quality? To what extent do teachers faithfully implement what they learned in professional development? Is there an association between new pedagogical practices and student outcomes?

Educational researchers have found it challenging to measure the effects of professional development on teacher and student outcomes for several reasons. First, it can be difficult to isolate the influences of professional development from those of other ongoing school initiatives, teacher practices, or state policies (St. John et al., 1999). Second, assessing impact requires measuring aspects of a program that may evolve over time. Third, the process of changing teacher attitudes and behaviors is highly complex (Guskey, 2002) and does not follow a tidy, linear path. Fourth—and perhaps most importantly—a confluence of factors affects children's achievement, including those operating at the individual, family, classroom, school, and societal level. Thus, it is not surprising that there is little direct evidence about the extent to which the components of teacher professional development are related to increased student achievement (Garet et al., 2001).

Rising to the challenge, we conducted research about the relationship between professional development and student outcomes related to a 5-year Striving Readers grant (2006–2011) funded by the U.S. Department of Education. The grant, one of eight in the first Striving Readers national cohort, supported intensive teacher training in literacy integration and a direct, targeted intervention for struggling adolescent readers.

Implementation Fidelity: The Key to Understanding Effects

This research brief aims to unpack the complex relationship between how effectively teachers implement what they learn in professional development sessions and their students' achievement. The goal is for practitioners designing schoolwide literacy initiatives to set realistic expectations about the extent to which teacher practices will change in response to professional development.

In addition to using traditional research methods (e.g., questionnaires and interview protocols) to measure teachers' experiences with professional development, we collaborated with school-based literacy coaches to measure the faithfulness with which participating teachers carried out activities as they were intended to be implemented.

Monitoring teachers' "fidelity of implementation" helps researchers and practitioners connect the dots between service delivery and impact; in short, it determines which parts of a program contributed to desired outcomes.

Having seen promising evidence of a link between teachers' fidelity of implementation and student literacy outcomes in our analysis, we asked six high-fidelity teacher implementers about the circumstances under which they applied what was learned in professional development. Although we were not able to interview low-fidelity implementers, we did examine the characteristics of these teachers for further insight into how practitioners might improve implementation quality among all groups of participants. We hope that findings from our research provide practical guidance to readers considering school-based interventions such as those built upon professional learning community models or initiatives designed to incorporate literacy across the middle school curriculum.

Context: Economically Disadvantaged Middle Schools

The 100 teachers in our study worked in four middle schools that were situated in a large, urban, economically disadvantaged school district located in the U.S. mid-south. The district employs more than 6,000 full-time teachers and ranks among the Nation's 25 largest, with approximately 105,000 students attending one of 200 schools at the kindergarten through high school levels. Eighty-six percent of the student body is African American, 8 percent is White, and the remaining 6 percent of students are from other races or ethnicities. Approximately 4,400 students attended the four schools in our study: two schools enrolled 1,500 students each, one enrolled approximately 850 students, and one enrolled approximately 590 students.

A 2-year, whole-school professional development initiative was intended to provide a critical mass of content teachers (i.e., those teaching mathematics, science, social studies, English/language arts (ELA), special education, or exploratory classes) with four semesters of university-level literacy courses, onsite literacy coaching assistance, and instructional materials. In addition, school leaders were invited to participate in an academy that was tailored to their needs. By engaging teams of school administrators and teachers, developers hoped to foster an educational environment with distributed support for the sustained use of literacy strategies. Altogether, 107 of the eligible 144 teachers (73 percent) working in the four schools participated in the professional development initiative.

In This Report

This report describes:

- the characteristics of middle school teachers rated as low-, medium-, or high-fidelity implementers of a literacy-related professional development program;
- an analysis of the state reading scores of 629 students taught by 12 of these teachers;
- the instructional philosophies of six high-fidelity implementers;
- the implications of our findings for practitioners charged with planning similar types of whole-school literacy initiatives; and
- the steps practitioners might take to improve teachers' fidelity of implementation of professional development.

Laying the Groundwork

In their study of teachers' instructional beliefs and decision-making, Sturtevant and Linek (2003) interviewed nine outstanding teachers about their professional development engagement, their perceptions about good teaching, and the contextual conditions that affect teachers' use of literacy practices. The researchers found that middle and secondary school teachers who excelled in blending content and literacy shared common commitments to lifelong learning and valued the importance of creating student-centered classroom environments.

Sturtevant and Linek's (2003) work frames our study. After finding that students of teachers at higher professional development implementation fidelity levels had demonstrated more significant gains in reading than students of teachers at lower fidelity levels, we set out to understand more deeply the teachers' practices and characteristics. We hope that the results from our study help school and district personnel think about how to more effectively engage their teachers in integrating literacy throughout the curriculum.

Our Research Questions

We posed four overarching questions in the pursuit of answers that might benefit practitioners responsible for carrying out literacy-related professional development:

1. What are the characteristics of low-, medium-, and high-fidelity professional development implementers?
2. How do students linked with teachers at different fidelity-of-implementation levels perform in reading as measured by a state test?

3. What are the beliefs and practices of high-fidelity implementers that might contribute to students' improvements in literacy?
4. What can be gleaned from examining high-fidelity implementers to help school districts that may be planning or implementing similar professional development initiatives focused on middle school literacy integration?

To answer these questions, we analyzed the achievement outcomes of students linked with content teachers who participated in a literacy intervention and were rated as low, medium, or high in implementation fidelity by literacy coaches. Findings from our statistical analysis—which showed that the ELA teachers' implementation fidelity level had a positive effect on students' posttest reading scores—compelled us to examine more closely the instructional practices of high-fidelity implementers and any possible differences in characteristics between low- and high-fidelity implementers that might help explain the student outcomes.

Professional Development Model

The professional development included four semesters of evening courses, onsite literacy coaching support, and curricular materials to support classroom implementation. The program was designed for individuals from content and exploratory disciplines with no prior knowledge of or experience integrating literacy strategies into their classrooms. Literacy coaches were on hand to support teachers' classroom strategy use and to increase students' opportunities to learn how to use the strategies independently.

The developers of this program hypothesized that greater and more effective integration of literacy strategies into the classroom by teachers would lead to student performance improvements in reading and the core academic content areas. They chose strategies designed to improve students' vocabulary, fluency, and comprehension, and they used an instructional model that stressed the use of guided practice and a gradual release of responsibility for the selection and use of literacy strategies from teachers to students. Eventually, students were expected to use the strategies independently. (See appendix 1 for topics covered in the professional development course.)

Professional development participants enrolled in one of four evening university classes designed to be content specific (i.e., related to mathematics, ELA, social studies, or science). Although the instructors who taught each class had related disciplinary experience (e.g., a science instructor taught science teachers), the literacy strategies taught and the sequencing of the course were generally consistent across the four content areas. The evening instructors followed course templates created by the program developer, and although there was some adaptation by instructors to accommodate their different teaching styles, the content delivered was generally consistent among the four classes.

While the structure of professional development was largely consistent across content areas, the developer and mathematics instructor found it necessary to adjust elements of the course model for mathematics teachers. Based on a formative assessment of and feedback from mathematics teachers over the 2-year program, the evening instructor modified several of the literacy strategies to maximize the relevance of using them for mathematics instruction. For example, she adapted a previewing text strategy for use with word problems rather than with expository texts as used by teachers in the other content areas. Mathematics teachers participating in the professional development sessions contributed to modifications that enabled greater and more effective integration of literacy strategies into mathematics instruction.

Methodology and Analysis

Teachers provided information using two surveys, a weekly checklist of literacy activities, and face-to-face interviews. We also designed and facilitated a structured rating activity that used literacy coaches to assess teachers' fidelity of implementation, and we analyzed students' matched baseline and follow-up scores on the state achievement test. Because this study focuses on how faithful participants were to an intended professional development model, it does not include a comparison or control group of teachers. Details about our research methodology, analysis, and study limitations are provided in appendix 2.

Study Participants

Three-quarters (75 percent) of the teachers in our study were women, 72 percent had worked at their current school for at least 3 years, and 58 percent had earned a master's degree or higher. Slightly more than half (53 percent) of teachers taught five class periods per day in various content areas or in special education and exploratory classes (i.e., art/music, physical education, or computers).

The characteristics of the students in our student outcomes analysis mirror those of the general population across the four middle schools: nearly all 629 students (94.1 percent) were African American, 89 percent received free/reduced-priced school lunches, and nearly all (96.9 percent) were native English speakers. Females comprised 55.3 percent of the sample, and 34.3 percent of students in the study were enrolled in ELA honors courses during the study period. Teachers who taught honors ELA sections also taught regular ELA classes. (See appendix 3 for the full demographic and background characteristics of the participants.)

Results

The analysis of implementation fidelity ratings assigned by the literacy coaches showed that 33 percent of the 100 participants were considered low-fidelity implementers, 35

percent were medium-fidelity implementers, and 32 percent were high-fidelity implementers. The background characteristics of the teachers at each implementation fidelity levels are summarized in table 1.

Table 1: Characteristics of Teachers Whom Coaches Rated as Low-, Medium-, or High-Fidelity Implementers (*N* = 100)

	Low			Medium			High			TOTAL
Gender	#	%		#	%		#	%		#
Male	13	52.0		9	36.0		3	12.0		25
Female	20	26.7		26	34.7		29	38.7		75
Years worked at current school*										
2 years or less	12	44.4		10	37.0		5	18.5		27
3 to 5 years	4	14.3		13	46.4		11	39.3		28
6 or more years	17	38.6		12	27.3		15	34.0		44
Unknown										1
Age										
20–29 yrs	8	40.0		9	33.3		3	15.0		20
30–39 yrs	11	42.3		7	26.9		8	30.8		26
40+	11	26.0		11	26		20	50.0		42
Unknown										12
Current level of education										
BA/ + 15 credits	16	39.0		13	32.0		12	29.0		41
MA/ + 15 credits	15	29.4		19	37.3		17	33.3		51
Ed specialist	2			3			2			7
Unknown										1
Content area of professional development										
ELA	9	27.3		11	33.3		13	39.4		33
Mathematics	10	35.7		10	35.7		8	28.6		28
Science	5	27.8		9	50.0		4	22.2		18
Social studies	9	42.9		5	23.8		7	33.3		21

* In 12 cases, we used the most recent hire date as proxy; one teacher had incomplete data.

There were few differences in the background characteristics of teachers rated at different implementation fidelity levels. A greater percentage of females than males were rated as high-fidelity implementers; however, it is possible that this difference might wash out if there were more men in the sample. Highest level of education was not associated with teachers' implementation fidelity ratings (nor was the number of days spent participating in other professional development activities, which is not shown in the table). Although the proportion of older teachers rated at a high-fidelity level of implementation (50 percent among teachers ages 40 and older) was higher than for younger teachers (15 percent among teachers ages 20–29), the differences were not statistically significant.

Seventy-five percent of the 100 teachers provided information about the level of preparation and frequency of using the 24 literacy strategies identified in the survey (provided in figure 1 of appendix 2). Although no differences emerged in teachers' *frequency* of using the strategies by implementation fidelity level, we found that teachers rated as high-fidelity implementers were more likely than low- or medium-fidelity implementers to *feel prepared* to do the following:

- model new learning strategies;
- differentiate instruction;
- teach students to ask questions before, during, and after reading; and
- provide guided practice.

Surprisingly, we also found that low-fidelity teachers engaged in the same number of weekly literacy activities as higher-fidelity teachers. In fact, over a full semester, low-fidelity implementers actually reported that, on average, they used more literacy activities than high-fidelity implementers, suggesting that the *quality* of strategy use matters more to high-fidelity teachers than the *quantity* of strategy use. It is important to note that teachers' reports were corroborated by other sources of information, such as our observations of teacher practice and entries in the logs maintained by literacy coaches.

Teachers from all fidelity groups used choral reading and academic word wall strategies; however, a greater number of higher-fidelity teachers than lower-fidelity teachers also used strategies that required more time to implement and higher levels of cognitive demand for students. Examples include strategies such as Question-and-Answer Relationships (QAR), K-W-L (What I Know, What I Want to Know, and What I Learned), concept maps, and student-generated questions. (See the glossary for descriptions of these strategies.)

These results indicate that a key distinction between the practices of high- and low-fidelity implementers centers around use of strategies as intended rather than the frequency of strategy use.

Student Outcomes

The analysis of students' reading outcomes includes 629 students taught by 12 ELA teachers: three low-fidelity implementers taught 173 students, seven medium-fidelity implementers taught 340 students, and two high-fidelity implementers taught 116 students. We focused on ELA teachers in this analysis, because no differences in relationships emerged between the implementation fidelity ratings of teachers from other content areas and students' reading scores.

Table 2 shows average pre- and posttest scores on the state reading test for seventh and eighth graders and for all students by the ELA teacher's implementation fidelity level. On average, scores for seventh graders remained steady (519.45 at pretest and 519.97 at posttest), while the average scores for eighth graders increased by over 10 points (rising from 519.24 at pretest to 529.86 at posttest). Results from the analysis indicate that scores increased significantly for eighth graders by teachers' implementation fidelity group, but not for seventh graders.

Table 2: Reading Scores by Teacher Implementation Fidelity Level for Grades 7 and 8 (*N* = 629)

	All Students	Low Fidelity	Medium Fidelity	High Fidelity
Grade 7 (*N* = 330)				
Pretest Score 2007–2008				
Mean	**519.45**	**517.05**	**520.42**	**520.76**
Standard deviation	28.96	29.57	29.46	24.29
Number of matched students	330	99	197	34
Posttest Score 2008–2009				
Mean	**519.97**	**520.14**	**521.65**	**509.71**
Standard deviation	30.52	34.53	27.00	35.75
Grade 8 (*N* = 299)				
Pretest Score 2007–2008				
Mean	**519.24**	**511.82**	**519.34**	**525.77**
Standard deviation	28.82	29.52	30.39	23.63
Number of matched students	299	74	143	82
Posttest Score 2008–2009				
Mean	**529.86**	**519.85**	**525.30**	**546.85**
Standard deviation	27.10	23.66	25.80	24.67

Data source: District file of state test scores.

Table 3 shows the average pre- and posttest scores for eighth graders by students' gender and teachers' level of implementation fidelity. Female students scored higher than male students at pre- and posttest: The average scores for male students rose from 512.81 to 522.29, while scores for female students increased from 524.06 to 535.53 over time. Results for eighth graders disaggregated by gender show that students linked with ELA teachers at higher-fidelity implementation levels had greater

average reading gains at follow-up than students of ELA teachers with lower-fidelity ratings. These results were significant across teacher implementation fidelity groups as measured by average posttest reading scores for both male and female students in eighth grade.

Table 3: Reading Scores by Teacher Implementation Fidelity Level for Males and Females, Grade 8 (*N* = 299)

	All Students	Low Fidelity	Medium Fidelity	High Fidelity
Males				
Pretest Score 2007–2008				
Mean	**512.81**	**502.58**	**513.43**	**524.53**
Standard deviation	32.70	34.75	33.36	24.44
Number of matched students	128	38	60	30
Posttest Score 2008–2009				
Mean	**522.29**	**508.68**	**518.25**	**547.60**
Standard deviation	28.99	21.96	27.13	24.67
Females				
Pretest Score 2007–2008				
Mean	**524.06**	**521.58**	**523.61**	**526.48**
Standard deviation	24.56	18.74	27.48	23.36
Number of matched students	171	36	83	52
Posttest Score 2008–2009				
Mean	**535.53**	**531.64**	**530.40**	**546.42**
Standard deviation	24.16	19.49	23.53	24.90

Data source: District file of state test scores.

Findings related to the analysis of associations among the implementation fidelity levels of science, mathematics, and social studies teachers and their students' reading scores were not significant. Results from the linear regression model shown in the appendix, however, show that all things being equal, an ELA teacher's implementation fidelity level significantly and positively affected a student's posttest reading score, although the size of the effect was small. (See appendix 3.)

High-Fidelity Implementers

The six high-fidelity implementers whom we interviewed had various years of teaching experience, ranging from 3 to 28 years. Three of the teachers were younger than the age of 40 and three were older, and five of the six had earned their master's degree. Two teachers taught mathematics, two taught science, one taught ELA, and one taught social studies. All teachers taught classes that included general education, honors, and special education students. Five teachers taught inclusive classes (i.e.., special and general education students together), and three teachers had a small number of students who were English language learners.

Three major themes emerged from the interviews with the high-fidelity teacher implementers: (1) the teachers shared a belief that all children are capable of learning; (2) they stressed the importance of assessing students frequently (whether informally or formally) and asking questions as a key to delivering effective instruction; and (3) their experiences integrating literacy strategies differed depending on the subject they taught.

"All Children Can Learn"

When asked about their teaching philosophies, five teachers expressed a belief that all students are capable of learning, and it was common for them to articulate a deep sense of caring for students as individuals. The social studies teacher reasoned that because "all children can learn," a teacher must be flexible in using techniques to reach students. The ELA teacher offered a nearly identical sentiment: "All children can learn something . . . if you hold high expectations, they're willing to meet them—especially if you care."

One science teacher, born and raised in the surrounding community, stressed the importance of creating a student-centered classroom and knowing her students as individuals. She stated:

> *My philosophy is that all students don't learn the same [way], and it takes an effective teacher in order to get things across to those students. Every child is not the same. That child is going to come with different kinds of baggage, and you have to learn what the child is like before you can reach the child . . . . If you wanted me to apply a theory to it, I would say something more like [I adopt] a constructivist theory—just getting kids in, getting their hands on things, getting them involved in the learning process.*

A mathematics teacher who expressed frustration and doubt in her ability to engage students in mathematics asked how she could "not care" about the students. "It's hard not to" [care], she reflected. "Good teachers are consistent," said another teacher; "They believe that their children can do something even when others think [the students] can't."

Because all six teachers described a concern for students and believed that all students were capable of learning, they tended to value flexible instructional approaches that could be adapted as needed to engage individual students.

The Importance of Asking Questions

Queried about the qualities of effective instruction, four of the six teachers described the critical role of asking frequent questions during lessons to assess students' understanding of text. One respondent who surmised that good teachers were "naturally gifted" but could nevertheless learn and benefit from professional

development felt strongly that effective teaching relied upon multiple approaches, as "no one program fits [all] content, grade levels, or child." Asked to describe what effective instruction looks like, a mathematics teacher said:

> *. . . It kind of depends on the type of activity that is going on in the class, but one overall item you should see are kids engaged, whether they are raising their hand, giving answers, or whether they've gone beyond that [and are] asking extension-type questions of the 'how comes, whys, and wherefores.'*

The other mathematics teacher described an effective teacher as one who "tells and lectures, but at the same time, asks questions. She's trying to get them to think," while a science teacher stressed the importance of assessing students' understanding through continuous reflection. The teacher embedded questions in all aspects of a lesson, and like another respondent, appeared to use literacy strategies as a form of assessment. For example, she conducted "quick assessments" using the K-W-L strategy described in this report's glossary (having students reflect on what I **k**now, what I **w**ant to know, and what I **l**earned) to determine students' knowledge base before discussing a topic deeply with students. The teacher also stated:

> *There isn't a day that goes by that I'm not assessing. That doesn't mean testing . . . My assessment may be [built] in with a student product for group work . . . a three-sentence paragraph . . . a three-question quiz . . . or a conversation with the student(s) just to see if they could use the vocabulary in their own terms.*

The ELA teacher, a self-described lifelong learner who tirelessly sought ways to improve her teaching, felt that effective classrooms were marked by the generation of questions among students and by constant feedback from the teacher. She said that she liked to ask questions while students read aloud to monitor their understanding of the text, and she shared the following in a later part of her interview:

> *I like to do assessments so that I can see where they are. Then, that way I know what I need to implement into my classroom . . . I try to get to know them and know where they are so that I know what methods I need to use in order to meet their needs . . . in an effective classroom, there's a lot of interaction—not just with the teacher telling the students and [students] answering questions, but I like to get my students to ask questions, because that way if they're asking questions, I know what they understand and do not understand.*

In addition to creating an environment in which students feel safe asking questions, the ELA teacher examined test data with a colleague to guide decisions about "what to teach first." Even one of the mathematics teachers who admitted to struggling with

literacy integration pointed to using concept maps as a type of "fun assessment." Drawn to mathematics for its precision and right answers ("I'm not a discussion person"), this teacher also created a learning climate in which students could take risks and possibly "fail" as they engaged in discussion of new concepts using the maps. She said:

> *The map . . . can go with anything. They can do the map on their own. It could be something to do at the end of a lesson just to see if you understand the direction I'm going. I can just use that as an assessment, which I have.*

Integrating Literacy in the Middle School Content Areas

Teachers' responses to questions about literacy integration mirrored patterns that we saw with a larger pool of teachers during classroom observations (not included in this report): ELA teachers used the most literacy strategies, while mathematics teachers used the fewest. For example, the ELA teacher we interviewed for this study noted that she chose literacy strategies to use with students in class based on the amount of information that students needed to learn, whereas a mathematics teacher who used drilling exercises to reinforce basic skills said she did not find most of the literacy strategies to be very useful for achieving specific learning objectives. The ELA teacher used QAR strategies, which she said helped improve students' reading comprehension because they learned to make inferences from text, a skill she felt was essential for success on the state test.

The two mathematics teachers, on the other hand, experienced difficulty implementing strategies other than the three they both reported using (concept maps, academic word walls, and a Frayer model). Although from different schools, both mathematics teachers described their classroom activities with striking similarity: both said they relied on "old school" drill and practice activities during instruction because some students in eighth grade had not yet mastered basic multiplication facts. Despite limited literacy integration by the two mathematics teachers, one respondent valued teaching her students to independently use graphic organizers because she felt doing so would improve students' comprehension of word problems.

Science and social studies teachers had an easier time integrating literacy into their content areas as a result of professional development. The social studies teacher considered what content she needed to teach in order to cover a state performance objective, and then pulled from her "bag of literacy strategies" one that would "match, depending on how I am going to present the lessons." Probed about why she used some of the literacy strategies learned in professional development despite finding them "noisy" and difficult to implement, she said that using the strategies was good for the students. She stated:

> *I'm a mother. It reminds me of how you want to get your children to eat vegetables, [so] you give them the good part and put the peas down underneath. You're incorporating what they need, but you're presenting it in a way that's desirable to them.*

One of the science teachers who felt she had been teaching reading skills for years emphasized using strategies learned in professional development that engaged students at higher levels of cognitive demand. Reflecting on how she selected a particular strategy to use in class, she acknowledged that often, teachers make "educated guesses" and described how she altered her approach to find one that worked best with students. She often used QARs in class because the tactic helped students develop higher-level thinking skills. She stated:

> *Even with the literacy strategies . . . you have all these different levels. Some of the things we learned [in the professional development] were very low key, such as word walls. I admit I don't care for word walls. That's a personal thing, but . . . I love the QARs! I think they should start teaching QARs in kindergarten . . . The kids go, 'I can't find the answers. It's not in the book.' No, it's not in the book, because it's a higher-level question . . . You teach the little tricks to the trade . . .*

Tying It All Together

In an analysis of the instructional beliefs of secondary teachers who skillfully blend literacy and content, Sturtevant and Linek (2003) found that exemplary teachers (e.g., strong literacy implementers) go above and beyond the minimum professional development or requirements of the job. (Others have called these types of teachers "innovators.") Because the teachers in our study who were considered high-fidelity implementers shared many of the characteristics and reported behaviors of lower-fidelity implementers, the possibility remains that other qualities unmeasured at present influence the differences noted in student outcomes. Our analysis found that students linked with high-fidelity implementing ELA teachers performed better on average at follow-up than students of lower-fidelity implementing teachers. The six high-fidelity implementers whom we interviewed shared a deep concern for students, stressed the importance of teaching students to ask questions, and used frequent assessment techniques to monitor students' understanding.

Although results from this study do not support the hypothesis that teachers viewed as high-fidelity used literacy strategies more frequently than lower-fidelity implementers, the analysis did find that high-fidelity implementers felt more prepared than others to model strategies. Because we corroborated the accuracy of teachers' self-reports with other data (e.g., coaching log entries and our own observations), it is possible that higher-fidelity implementers selected and used literacy strategies more strategically or judiciously and with higher quality than lower-fidelity implementers. Teachers in the

former group may even be better “consumers” of professional development, as suggested by Sturtevant and Linek (2003).

Because study participants had experienced only half of the 2-year intervention when this analysis was conducted, differences in frequency of strategy use may emerge by the end of the full term of professional development. It is possible, however, that high-fidelity implementers use strategies that require a greater investment of time and/or more cognitive press among students than strategies commonly used by lower-fidelity implementers. If that is the case, then we would not see more frequent literacy strategy use among professional development participants rated as high-fidelity; rather, we would observe use of strategies that call for higher-level intellectual engagement among students in the classroom. The high-fidelity implementers whom we interviewed described their process of making instructional decisions, such as when to apply a specific literacy strategy; at times they made calculated or deliberate choices (i.e., used a calendar and planned strategy use in a lesson). At other times, they reached from their toolkit during a lesson when they discovered that planned instruction was ineffective. These teachers remained flexible and open to using whatever approach appeared to raise student engagement in a lesson.

Additional analyses are necessary in order for us to better understand why student reading outcomes were not associated with the fidelity of implementation scores of mathematics, science, and social studies teachers. We may find positive relationships between content test scores and teachers’ implementation fidelity ratings; however, our primary research goal was to measure the effect of the professional development on students’ reading outcomes. It would be premature for us to draw conclusions about the effects of literacy integration among non-ELA content teachers on students’ learning outcomes before all analyses have been conducted.

The gender gap favoring female students that we uncovered in our analysis of pre- and posttest reading scores is consistent with Gary Marks’ (2008) international research showing that female adolescents scored higher than their male counterparts in all 31 countries analyzed. Interestingly, while female students, on average, scored higher than male students in our study, the male students in the classrooms of high-fidelity implementing ELA teachers closed the gender gap by the time of the posttest. Average reading scores for the 30 male students linked with high-fidelity ELA implementing teachers rose over 23 points (from a mean score of 524.53, SD = 24.4 to 547.60, SD = 24.7, respectively) which was similar to the gains in average reading scores among 52 female students linked with high-fidelity implementers. The scores for these female students rose from 526.48 (SD = 23.4) to 546.42 (SD = 24.9) over time.

Our findings about the gender differences in reading scores is particularly interesting given Marks’ (2008) review of literature that found that the type of testing material used with students narrows or widens the gender gap in reading performance. For example, one study conducted in the 1990s found that while females outperformed

males in reading when asked test questions about stories, the gender gap narrowed or even disappeared when test takers were asked to interpret information that was presented in charts, graphs, maps, and timetables. This finding is intriguing in light of our own research, because several teachers rated as high-fidelity by their literacy coaches in this study had reported using graphic organizers with their students. Although we cannot say with certainty whether the use of graphic organizers, concept maps, or K-W-L charts (and so forth) contributed specifically to the achievement gains noted among the male students, it is an area of research worth exploring, as it may illuminate a path to raising the reading skills of struggling adolescent male students.

Implications for Educational Decision-makers

The lessons we learned from our study have implications for schools and districts charged with offering effective professional development with limited to no financial resources. For example, we learned from high-fidelity implementers the importance of modeling literacy strategies before, during, and after reading; this approach can be touted in grade-level, departmental, and faculty meetings and can be replicated at no cost in classrooms. Schools and districts can stress the value of modeling strategies for students and be creative in providing opportunities for teachers to practice modeling before rolling out new strategies in "prime time" with students in the classroom.

To improve teachers' fidelity of implementation of literacy-related professional development, districts can consider creating building-level literacy support by recruiting administrative teams (principals, assistant principals, instructional facilitators, coaches) to take the following steps:

- Introduce and model a literacy strategy or tactic for 5 minutes as part of regular staff meetings.
- Look for and acknowledge student use of literacy strategies.
- Encourage staff to devote a portion of interdisciplinary or grade-level team meetings to literacy.
- Include literacy practices as part of a school's improvement plan.
- Celebrate literacy publicly throughout the school through use of:
    - Repeated exposure to messages highlighting the importance of reading (e.g., banners posted throughout the school and messages on a school's website, in the school's newsletter, and in communications with parents).
    - Showcases of student work on bulletin boards in public spaces throughout the school (hallways, library, cafeteria, main office, all-purpose room).
    - Daily school announcements (introduce and encourage frequent use of "the word of the day" or implement daily schoolwide challenges announcing the first class to find the error in a sentence read aloud during homeroom).

The successful implementers in our study used literacy strategies as a form of assessment, which suggests that assessment and question-generation should be emphasized in any professional development aimed at improving teachers' literacy integration and students' subsequent reading comprehension. Specifically, professional development that demonstrates how the use of literacy strategies as both a way to teach content and as a means of obtaining informal assessments of student learning encourages the type of responsive and reflective teaching required to raise the achievement of high-risk, struggling student populations.

The high-fidelity implementers whose literacy integration required students to use higher-order thinking skills are precisely the kind of teachers who can guide colleagues in successful schoolwide literacy efforts. Urban, economically disadvantaged schools such as those we studied can capitalize on and disseminate the practices of the high-quality teachers already in the building. Teacher mentor programs, team teaching structures, and professional learning communities in schools are a few practical professional development models that may hold promise for enhancing teaching and learning. Perhaps integrating literacy strategies as a primary focus into existing teacher development programs and school-level interventions would be an important first step in harnessing the power of high-quality teachers.

Most importantly, because this study empirically links high-fidelity implementing ELA teachers with student reading outcomes, the practical implications for ELA teachers are substantial. Our findings suggest that:

- The high-quality, strategic use of literacy strategies within ELA classroom instruction affects students' reading achievement and has the potential to close achievement gaps between male and female students.
- School districts should incorporate literacy strategies across the curricula.
- Literacy coaches and other teacher support personnel need to help teachers recognize the significance of appropriately distinguishing among use of different strategies for achieving various learning goals.

Finally, this study has implications for schools and districts looking for instructional interventions to support the success of their struggling students. This includes finding ways to retain master teachers so they can share with colleagues their knowledge of pedagogy and promising instructional practices as one way to improve evolving professional development models. Although practitioners understandably feel pressured to find what some refer to as an intervention "off the shelf," we hope that the findings from this study will help educators reflect on how to leverage the effective practices of high-quality teachers already in their schools and to view the *teacher* as the best catalyst for achieving positive student impacts.

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Appendix 1: Glossary

Concept map: A general term for a form of "mapping" or pictorial representation of how concepts/facts in text are connected and organized. Examples of graphic organizers include story maps, semantic maps, bubble maps, K-W-L, character maps, cause-and-effect maps, problem-solution frames, Venn diagrams, and timelines. Graphic organizers might also be called thinking maps. They can be used by students individually at desks or in groups, or by whole class using the blackboard/whiteboard, overhead projector, or other means of technology.

Frayer model: This type of graphic organizer, an adaptation of concept maps, includes the concept word, definition, characteristics of the word, examples, and "non-examples" of the chosen concept word.

Interactive academic word wall: A word wall should be clearly marked, posted, visible, or presented to students so they have access to the words during related activities, which may include vocabulary games. Words should be posted on the wall and easily visible. Use of the word wall would include adding new words or overtly referring to posted words.

K-W-L: This strategy aims to activate students' prior knowledge about a topic before reading, provide structure during reading by encouraging mental or written note-taking, and facilitate new learning by having students construct questions for further study. Students' background knowledge guides instruction. Specifically, before reading, the class creates a chart or outline that lists information students know about a topic and any related experiences they may have had. During reading, the teacher guides students in taking note of concepts within the text or activity about which they would still like to learn. After reading, the teacher elicits student responses about what has been learned.

Question-Answer Relationships (QAR): A strategy that can be used to increase comprehension during or after reading or to develop test-taking skills. There are two categories of QAR: In the Text and In my Head. These two categories are divided into four QAR types. Students are taught to identify the types of questions they are being asked—that is, whether the answer can easily be found in the text, in words that are both close to and similar to the subject of the question ("Right There"); whether the student will need to think about and find information included throughout the text to answer the question ("Think and Search"); whether the student would need to combine his or her prior knowledge with information from the text ("Author and You"); or whether the student will have to answer the question entirely from his or her prior knowledge ("On my Own"). The teacher and students may use a table to organize their thoughts.

Student-generated questions: The students pose questions about the material read or learned, often using question stems provided by the teacher and/or whole class. This is a planned activity in which students are often in groups and are told to formulate thoughtful questions, not a spontaneous activity inviting typical student questions.

Appendix 2: Topics Covered in Professional Development

First Year	Gradual release of responsibility: Vygotsky's zone of proximal development (direct instruction) Improving vocabulary learning in your subject area Whole class choral reading applied in your subject area Written academic learning summaries Helping students succeed in academic literacy review of strategies Improving comprehension: student-generated questions Question-Answer-Relationship and Bloom's question stems applied in your subject area Improving vocabulary knowledge: semantic features analysis and the Frayer model
Second Year	Improving students' reading fluency of content reading assignments: reader's theater, buddy reading, and radio reading Teaching tactic/concept: before, during, and after reading academic text assignments Administer "word maps pretest" with students Classroom blogging (with or without technology) Marzano's question stems Previewing text/THIEVES and SEARCHES techniques Neurological impress and scooping

Appendix 3: Technical Notes about the Methodology and Analysis

This section describes the technical aspects of our analysis, such as the instruments used for collecting information, the analytical approach, the statistical tests performed, and the study's limitations. We also include statistical tables that are referenced in the text for readers interested in reviewing the results of our study in detail.

Instrumentation

For this report, we collected information about self-reported literacy strategy use among the teachers for whom literacy coaches provided implementation fidelity ratings (this included 100 of the 107 participants originally enrolled in professional development). The literacy coaches' ratings were then linked with the pre- and posttest scores of students who had been enrolled in an ELA teacher's class for more than half the instructional year and were not in special education self-contained classes. Matching baseline and follow-up state test scores also were provided and were included in the analysis.

A total of 629 students taught by 12 ELA teachers met these criteria. Scores on the state ELA exam served as the outcome measure. The pretest was administered during the spring before the intervention (when students were in sixth or seventh grade), and the posttest occurred 7 months later (when students were in seventh and eighth grade, respectively).

To investigate teachers' self-reported literacy strategy use, we asked teachers at the end of the school year how prepared they felt to use specific literacy practices throughout the preceding school year, and how frequently they used them. (The literacy strategies used are presented in figure 1.) Responses to survey items were provided using a five-point Likert scale ranging from "not at all prepared" to "I can teach others" on the preparation measure, and from "never" to "almost always" on the frequency measure.

Figure 1: Literacy Strategy Survey Domains

1. Have students read aloud for at least 5 minutes per period
2. Identify "bridging books" (part story and part information)
3. Ask higher-order questions and require students to justify their answers
4. Pretest students before the beginning of a new unit of instruction
5. Discuss and analyze new vocabulary before reading

6. Show relationships of words/concepts using graphic organizers
7. Create, elaborate, and sort subject-related vocabulary word lists
8. Establish the purpose(s) for reading a text selection
9. Have students read in pairs
10. Model for students/provide guided practice with feedback
11. Model use of thinking maps to construct written summaries of text
12. Link students' background knowledge and experiences to new vocabulary
13. Model new learning strategies for students
14. Differentiate instruction using multileveled materials
15. Teach students to ask questions before, during, and after reading text
16. Provide guided practice for trying out new learning skills with feedback
17. Provide instruction on the different forms of writing found in textbooks
18. Offer small group instruction/practice according to achievement levels
19. Use the writing process as part of content learning
20. Adapt instruction for students having special needs
21. Use cooperative learning groups
22. Use oral reading (whole class/small group) in subject area materials
23. Use state testing data to identify students' reading levels
24. Use direct, explicit instruction when teaching new reading/study skills

As indicated in the body of the report, 75 of 100 teachers provided survey responses about how often they implemented the strategies and how prepared they felt doing so in the past school year. Results from the analysis showed that teachers rated as high-fidelity implementers were more likely than low- or medium-fidelity implementers to *feel prepared* to model new learning strategies ($F = 3.30$; $df = 2,73$; $p = .042$), differentiate instruction ($F = 4.63$; $df = 2,73$; $p = .013$), teach students to ask questions before, during, and after reading ($F = 3.37$, $df = 2,71$; $p = .040$), and provide guided practice $F = 5.26$; $df = 2,73$; $p = .007$). However, no differences emerged in teachers' self-reported frequency of using the strategies by implementation fidelity level. Although we summarize these results in the body of this report, it is important to present the results in greater detail so that readers may review the difference in mean scores and statistical levels of significance.

We also administered a weekly checklist for teachers to complete in the evening professional development sessions. Eight checklists were distributed during an academic semester. Specifically, we asked whether teachers had engaged in the following activities in the past week:

- informally assessed students' use of a strategy;
- put students in cooperative groups with assigned roles;
- used a literacy strategy (and if so, which one);
- reassessed students' content knowledge; or
- formally assessed students' strategy use.

Researchers calculated an overall "weekly implementation of literacy activities" score for participants based on the number of positive responses reported and computed an average score across each participant's number of checklists completed. Results showed that teachers rated as low-fidelity implementers actually reported a *higher* mean score of literacy activities than teachers rated as high-fidelity implementers ($F = 4.009$; $df = 2, 93$; $p = .021$), suggesting that the *quality* of implementation strategies used matters more to high-fidelity implementers than the *quantity* of strategies used.

At the end of the school year, we asked literacy coaches to consider the evidence they collected about teachers' implementation fidelity from personal observation notes, internally created checklists, lesson plans, and student artifacts. We provided the six coaches with a rubric created by grant stakeholders. It included descriptions of implementation at various levels of fidelity related to teacher planning. The instructions indicated that coaches were uniquely positioned to rate by virtue of their frequent teacher interactions and observations. Coaches used the rubric to rate a teacher's current status along the fidelity continuum, ranging from the optimal level of strategy implementation (as designated by developers of the intervention) to business as usual.

The six domains used either a three- or four-point scale and reflected the extent to which coaches observed teachers:

(1) introducing a strategy and describing its purpose when used;
(2) consistently modeling the use of a strategy;
(3) providing multiple guided practice activities using a variety of texts;
(4) providing opportunities for students to practice strategies independently;
(5) differentiating instruction based on analysis of progress monitoring; or
(6) revisiting previously introduced literacy strategies by creating opportunities to apply them to new material.

We also conducted face-to-face, individual interviews with six teachers rated by coaches as high on implementation fidelity. Using the semistructured interview guide

provided in this appendix, we asked respondents to discuss their views about the essential ingredients of effective instruction, their teaching philosophy, their perceptions about what constitutes "good teaching," and their experiences integrating the literacy strategies learned in professional development. Interviews each lasted approximately 40 minutes and were audiotaped and transcribed for analysis. Using grounded theory (Glaser and Strauss, 1967), we analyzed responses across the interviews and identified themes and patterns that emerged.

Finally, we analyzed the individual test scores of students linked with teachers whom coaches rated to detect whether relationships might exist between the fidelity of implementing strategies learned during professional development and student achievement. Statistically significant results summarized in the report body are at the $p < .05$ level.

Analysis

We analyzed teachers' demographic characteristics, self-reported practices, and coaches' fidelity ratings. Students' scale reading scores and demographic characteristics (gender, race/ethnicity, grade level, English language learner (ELL) status, free/reduced price lunch status) were also analyzed.

First, we compared the mean results on students' pre- and posttest reading scale scores on the state test as well as the number of items correct and the proficiency level on each content area test. Next, we ran correlations, T tests, and analysis of variance models to determine whether differences in mean test scores were significant within and across groups. Finally, we modeled teachers' implementation fidelity level on the posttest reading scores, using students' pretest score, gender, ELL status, grade level, ELA honors class enrollment, and number of days enrolled (between 77 and 155 days) as covariates. This allowed us to estimate how much variation in student achievement scores could be attributed to specific variables.

Limitations of the Study

Readers weighing the implications of our findings should consider the study's limitations. First, because we investigated the fidelity of implementation among teachers participating in professional development, we do not present findings from a comparison or control group of teachers, which typically adds rigor to a study. Second, respondents may have had difficulty recalling accurately how often they employed a particular strategy in class in the past school year (as measured by the annual teacher implementation of surveys questionnaire) and thus may have over- or underestimated the frequency with which activities occurred. Third, as researchers, we may have neglected to measure other important influences on professional development participation and factors related to teachers' fidelity of implementation. Fourth, the fact that we restricted our interviews to high-fidelity implementers rather than a

balance of teachers rated as low or medium in fidelity likely limits our analysis concerning the characteristics and behaviors of the full range of professional development participants. Finally, our analysis of student data will be strengthened by the addition of a norm-referenced outcome measure and by analysis of multiple data points rather than pre- and posttest data only.

Appendix 3 *(Continued)*

a. Semi-Structured Teacher Interview Guide

1. Let's talk a little about your professional background: How long have you been teaching at this school? For how long have you been teaching in general?
2. What grade level and course content do you teach? [Do you teach gifted/talented, linguistically diverse, and/or struggling readers?]
3. Why did you become a teacher?
4. How would you describe your teaching philosophy?
5. How would you define "effective instruction?"
    a. [Probe: What, specifically, does "effective instruction" look like in action?]
    b. [Please describe things you do to improve your effectiveness as a teacher.]
6. In your view, how consistent is what you learned in [the professional development program] with your beliefs about effective instruction? [Please describe what makes you think so.]
7. Please describe what, specifically, you learned in [the professional development program] that you plan to continue using or doing.
8. Let's talk about your perceptions of the qualities of good teachers.
    a. What traits do "good teachers" share in common?
    b. Please describe what "good teachers" do that distinguishes them from others.
9. Given all that you do, which of your instructional decisions have the most positive impact on student achievement? Probes:
    a. [What makes you say so?]
    b. How many of those decisions did you learn to make in [the recent professional development program]? (or how much of your decision-making was influenced by the recent professional development program?)
10. What affects your decisions about whether or not to use literacy strategies during instruction? Probes:
    a. [How do you decide which strategy to use?]
    b. [How do you decide with which content to pair strategy use?]

11. Please describe how, specifically, you integrate reading, writing, and discussion into your classroom practices? Probes:
    a. [How do you prepare a lesson?]
    b. What do you expect your students to do during the lesson?
    c. Are these things you did *before* participating in [the recent professional development program] or things you learned while in the program?
12. In general, how easy or hard do you think it is to effectively integrate literacy into middle school content area instruction? Probe:
    a. What, specifically, makes it easy or hard?
13. Which literacy strategies were most effective in engaging students?
14. Finally, was [the professional development program] influential in creating a small learning community in your school?
    a. Did your school already have a small learning community in place prior to [the professional development program]?

Statistical Tables

a. Characteristics of Teachers in the Study (*N* = 100)

	#/%			#/%
Gender			**Age**	
Male	25		20–29 yrs	20
Female	75		30–39 yrs	26
			40+	42
License type			Unknown	12
Professional teacher	57			
Alternative	23		**Years worked at current school***	
Other	11		2 years or less	27
Unknown	9		3 to 5 years	28
			6 or more years	44
Current level of education			Unknown	1
BA/ + 15 credits	41			
MA/ + 15 credits	51		**Race/ethnicity**	
Ed specialist	7		African American	79
Unknown	1		White	12
			Unknown/other	9
Attended intervention course in subject area				
English/language arts	33		**School district alumnus**	
Mathematics	28		Yes	49
Social Studies	21		No	40
Science	18		Unknown	11
Number of daily class periods			**Teaches a course in:****	
Two or fewer	3		English/language arts	24
Three or four	11		Mathematics	20
Five	53		Reading	6
Six or more	10		Social studies	18
Unknown	23		Science	18
			Special education	23
			Other	20

Data source: teacher survey and district files, 2009

* In 12 cases, most recent hire date in the district served as proxy.
**Does not total to 100 since 23 teachers taught more than one area.

b. Characteristics of Students in the Study (*N* = 629)

	#	%		#	
Gender			**Race/ethnicity**		
Male	281	44.7	African American	592	94.1
Female	348	55.3	Other	37	5.8
Grade level			**Native English Speaker**	610	96.9
Grade 7	330	52.5			
Grade 8	299	47.5			
			Receives Free/Reduced-Priced Lunch	560	89.0
ELA Honors Grade 7	119		**ELA Honors Grade 8**	97	
Females	75	63.0	Females	62	63.9
Males	44	37.0	Males	35	36.1

Data source: District files, 2008–2009 school year.

c. Teachers' Weekly Implementation of Activities Score by Fidelity Rating

	Low Fidelity	Medium Fidelity	High Fidelity
Mean WILA score	5.136	4.255	4.476
N size	32	33	31
Standard deviation	1.25	1.37	1.25

Source: Weekly checklists, 2009, and literacy coach implementation rubric.

d. Linear Regression Table

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	111.861	75.07		1.49	0.137
Scale score reading LA (pretest)	0.547	0.034	0.538	15.953	0.000
Grade	9.671	1.802	0.165	5.366	0.000
Gender	4.369	1.798	0.074	2.430	0.015
Honors ELA	8.687	2.081	0.141	4.175	0.000
ELL status	4.126	5.189	0.024	0.795	0.427
Days enrolled > 77	0.293	0.465	0.019	0.63	0.529
ELA teacher fidelity of implementation level	2.856	1.348	0.065	2.118	0.035

Dependent variable: reading/language arts scale posttest score (R square = .437).
Source: Student achievement files provided by school district.