Continued Integration of Curriculum Guides, Quarterly Benchmark Assessments, and Professional Development to Improve Student Learning in Mathematics and Science

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Abstract

This investigation is part of a longitudinal study to explore long-term effects of sustained use by teachers in a large urban school district in southern California of standards-based curriculum guides, quarterly benchmark assessments, and focused professional development to improve the achievement of their students in math and science content as measured by the California Standards Test in mathematics and science reported as part of each school's Annual Yearly Progress. Elementary students' growth in math and science achievement surpassed their achievement in English Language Arts for the past several years of our project. The growth of elementary students in this district continued to compare favorably to that of other students at the same grade level in the county and the state. Elementary English Learners outperform English Only students in math as evidenced by their increased growth in proficient and advanced levels of achievement.

In the 1990s, national educational reform focused on the establishment of rigorous content standards. Currently, educational reform is not only related to standards but also to assessment and accountability. The Elementary and Secondary Education Act (1965) and its new incarnation as the "No Child Left Behind" legislation require that children who have not yet acquired English language proficiency be included in evaluations of schools that receive federal funding (Aguirre-Munoz & Baker, 1997). Once, English Learners (ELs) were exempted from large-scale assessments but they now are assessed in order to acquire a more accurate picture of overall student achievement and growth (Abedi, 2001). As Barton (2004) contended, even though larger numbers of minority students are taking more rigorous courses, there has not been the narrowing of the achievement gap that one would expect from increased advanced course taking. For the last ten years, the achievement of African-American and Latino students has not shown substantial gains (National Study Group for the Affirmative Development of Academic Ability, 2004).

As a more systemic approach to closing achievement gaps and improving learning for all students, the National Study Group for the Affirmative Development of Academic Ability (2004) suggested access to a combination of educational interventions in the classroom, school, and community. Its recommendations included applying research-based pedagogical practices to help student learning, establishing more supplementary learning opportunities, helping teachers master their subjects, providing challenging academic work for students, and using instructional methods that build on what students already know. Much of the literature supporting these recommendations recognized the importance of standards-based instruction as a critical component of successful practice. Tucker and Codding (1998) described a standards-based classroom as one with explicit indicators of quality work, what Phil Daro called a "quality triangle": standards-driven content of instruction, student outcomes, and assessment of student work. More than standards are needed to improve student achievement. O'Shea (2005) outlined a coordinated plan that included not only standards-based lessons but also curriculum pacing guides with explicit student learning outcomes, district-wide benchmark testing that correlate to statewide standards assessment, and professional development for teachers in the content of the standards.

O'Shea's plan echoes the current emphasis on more rigorous assessment and accountability as another important aspect of education reform. Shepard (2000) proposed that classroom assessments must match "challenging subject matter standards and be connected to contexts of application (p. 31)." Assessments must be linked to classroom instruction promoting not teaching to the test but genuine conceptual understanding.

Beyond the need for rigorous standards, assessment and accountability are the findings of Elmore (2002), Gandara, Maxwell-Jolly, and Driscoll (2005), Darling-Hammond (1999), and O'Shea (2005) who advocated for focused professional development of teachers as a means of improving student performance. Elmore (2002) stated that increasing student achievement depended on "improving teachers' 'capacity' (the knowledge and skills of teachers)--changing their command of content and how to teach it--and helping them to understand where their students are in their academic development. . .You can't improve a school's performance, or that of any teacher or student in it, without increasing the investment in teachers' knowledge, pedagogical skills, and understanding of students (p. 36). " O'Shea (2005) echoed this idea in proposing that, despite the helpfulness of curriculum guides and instructional resources, it is prepared teachers making informed planning decisions in their classrooms that improves student learning.

Research Focus

This study is investigating the following research questions:

1. What constitutes effective professional development that promotes student achievement in math?
2. What constitutes effective professional development that promotes student achievement in science?
3. Do students who showed gains in elementary school math persevere in doing well in middle school?

Mathematics and science are the targeted curriculum areas for the present study, and the form of professional development for this study has been adapted primarily from Guskey (1986) and Loucks-Horsley, Hewson, Love, and Stiles (1998). To facilitate sustained and significant educational improvements, the Guskey model of professional development incorporates the explicit means of communicating instructional goals. In the case of this study, the goals were overt specific pedagogical techniques woven into content standards and aligned to the curriculum guides. The use of manipulatives to address higher-level relational and conceptual knowledge facilitated teacher learning in concrete, rather than abstract terms. The research of Loucks-Horsley, Hewson, Love, and Stiles (1998) suggested that professional development that affects change must be on-going, rigorous and focused. An intent of the professional development provided as part of this study was to provide opportunities throughout the academic year for teachers to access lessons and materials to support them as they taught the California State Content Standards in math and science.

Method

The study consisted of a three-pronged alignment: alignment of scope and sequence of curriculum guide to standards; alignment of curriculum and classroom instruction to assessments and alignment of professional development for teachers to the content standards applied to mathematics and science education in a K-12 district with a large inclusion of EL learners and low income families.

Participants

The participants in this study consisted of all 1066 teachers in self-contained classrooms, grades K-6, as well as in grades 6-8 from a large urban unified school district in southern California along with their 17138 respective students. The school district, designated as a "Program Improvement District", has a diverse student population that, in the academic year 2005 -2006, was reported to be 0.9% Pacific Islander, 0.1% Filipino, 72.3% Latino, 25.9% African American, and 0.2% non Latino White (California Department of Education, 2006). In 2004-2005 ninety-five percent of the student population received free or reduced lunch. Sixty percent of the student population in grades 2-8 are designated as English Language Learners in 2006. The teachers represent equally diverse backgrounds, with 0.5% Native American, 4.5% Asian, 7.2% Filipino, 22.8% Hispanic, 44.3% African American, 19.9% White and 0.3% other. Seventy-six percent of the teachers are fully credentialed up from 50.2% of teachers as of 2004-2005, compared with 94.5% for the state of California. This district received no other interventions for math and science curriculum or content delivery other than the program being reported in this study.

Mathematics Professional Development

In this large urban school district, as in the rest of the State of California, the State Mathematics Content Standards, adopted in 2000, are the curriculum for grades K-12 as well as the basis for the California Standards Test (CST) given to students in grades 2-11. District elementary teachers use state-adopted textbooks in math but these are nationally marketed and contain lessons that do not address grade level State Mathematics Content Standards. In addition, some of the standards are not addressed at all in these textbooks (Appendix A). Prior to the mathematics interventions, the elementary teachers used these texts as their sole instructional resource. As O'Shea (2005) noted, nationally marketed textbooks do not serve as effective pacing guides for an individual state's standards; therefore, curriculum guides were a necessity for the teachers. Given the review of the literature, it was deemed critical to provide teachers with a means of assessing their pupils' achievement of the standards being taught, and professional development opportunities for mastering the content and optimal pedagogical practices. Thus, the approach was three-pronged: content curriculum guides, benchmark assessments and professional development.

Math content curriculum guides were initially introduced to elementary school administrators in August 2003. Each grade level guide was aligned to grade level content standards and the district-adopted math textbook. The first step was to determine the order of standards to be taught as well as the grouping of standards to be taught. Standards were organized into topics and allotted a certain number of weeks for instruction. Pacing of the standards was aligned with the CST blueprint for each strand (Number Sense, Algebra & Functions, Measurement & Geometry and Statistics, Data & Probability), where applicable. For each standard, performance objectives indicating a student's level of mastery of a particular standard were also written into the curriculum guides. Also included were teaching resources, such as textbook lessons, alternative teaching strategies, literature books and lessons offered by our project through professional development, all of which could be used by teachers in their attempts to teach the standards. Each unit (set of topics) also had an opening activity to allow a teacher to assess prior knowledge, as advocated by the National Research Council (2000, 2005). Model tasks were coded when they included strategies recognized as effective for teaching English Language Learners, such as Graphic Organizers, Direct Modeling, Sentence Frames, or Chants. Each page of the guide also contained a textbook reference indicating key vocabulary as well as materials needed for that particular unit (Appendix B). Lastly, each guide had a page containing a list of textbook lessons that did not address particular grade level standards as well as a list of standards not covered or not sufficiently covered within the adopted textbook.

Before the curriculum guides were provided, elementary teachers taught lessons in the text without regard to appropriateness or correlation to grade level standards.

In the 2003-2004 academic year, 190 K-12 teachers participated in professional development, either in 40 hour summer institutes or release day sessions. In the 2005-2006 academic year, 257 elementary teachers participated in these professional development opportunities for a total for 6103.5 hours while 17 middle school teachers attended only 513.5 hours of math professional development. One of the middle schools did not send any participants to the professional development sessions. In the summer 2004 institute, only 60% of the schools had participants. In the 2005-2006 academic year, 100% of the elementary schools participated in professional development. A typical 8-hour session included 1.5 hours for the reading and discussion of research related to current educational reform, 1 hour for the analyzing of standards, the curriculum guides and the quarterly benchmark results with the remainder of the day being devoted to engaging mathematical investigations to support both content and pedagogy.

Quarterly assessments were used by elementary classroom teachers from the 2003-2004 academic year initial administration to the present. These were revised for the 2004-2005 academic year.

Science Professional Development

In spring 2005 teacher leaders from our project designed K-5 science curriculum guides. These were distributed to teachers in the fall of the 2005-2006 academic year. The science curriculum guides were modeled after the math guides that had been used for several years in this district with one major difference. Because the state of California administers only language arts and math California Standards Tests (CSTs) in grades 2-4, the guides were written to enable teachers to incorporate science during their language arts instruction. Thus, the guides were written with the language arts lessons from the state-approved language arts scripted series as the driver of the curriculum. The teachers were shown during professional development how the science lessons connected to the reading comprehension skills they were teaching to their students. As they taught these skills (which are also science process skills), they were encouraged to teach science lessons during their inquiry blocks. The guides also incorporated performance objectives, textbook references, and supplementary resources such as the project's investigations presented during professional development, websites, and videos. Model tasks were coded when they included strategies recognized as effective for teaching English Language Learners, such as Graphic Organizers, Direct Modeling, Sentence Frames, or Chants.

In the 2005-2006 academic year, 299 elementary participants attended 7380.5 hours of science content professional development with 100% of the elementary schools sending participants while 18 middle school teachers participated in 304 hours of science content professional development. Two middle schools did not send participants to any science sessions. Most of the participants were primary teachers (Pre-Kindergarten through grade 1). A typical 8-hour session included 3 to 4 science investigations with teachers discussing the curriculum guides during the sessions to support both content and pedagogy. The lessons always began with an engagement component that checked for students prior knowledge (National Research Council, 2000, 2005).

Because the state of California administers only a grade 5 science CST, quarterly assessments were written for only grade 5 standards and these correlated to curriculum guides.

Results

Growth in student performance was analyzed by student achievement, based on the CST[1]. The CST is given to all students, grades 2-11, and is based solely on the California Content Standards. Students are placed into one of five categories, based upon their performance on this exam: Far Below Basic, Below Basic, Basic, Proficient or Advanced. The school district showed an increase in the growth of students from the 2004 CST to the 2005 CST in math for grades 2- 5 (see Figure 1).

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[1] In looking at student achievement, this study examined only the percent of students who had achieved at the Proficient or Advanced levels as these are the ones that determine whether the schools in the district have attained the Annual Yearly Progress (AYP) mandates by the No Child Left Behind legislation. Students also advanced from below basic to basic levels, but since this is not part of the AYP, this study chose to ignore that data. At the middle school, this study looked at the math results for grades 6 and 7 as well as Algebra I for grade 8.

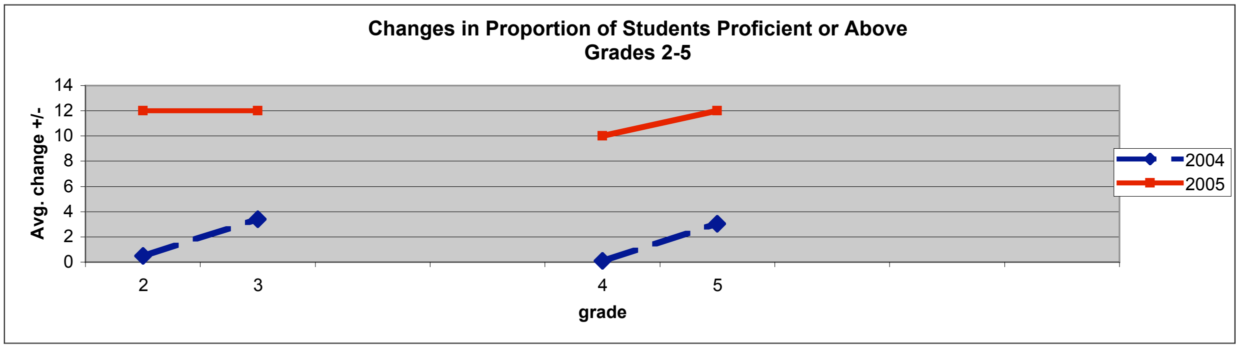


Figure 1

Figure 2 shows that in the 2006 administration of the CST, when students are learning to read in grades 2 and 3, their English Language Arts (ELA) growth surpassed that of their math. But in grades 4 and 5, as well as grades 7 and 8, when they are reading to learn, their math growth surpassed their English Language Arts growth. The elementary teachers at these grade levels attended professional development for their language arts series but in math they also had curriculum guides and benchmark assessments to support instruction.

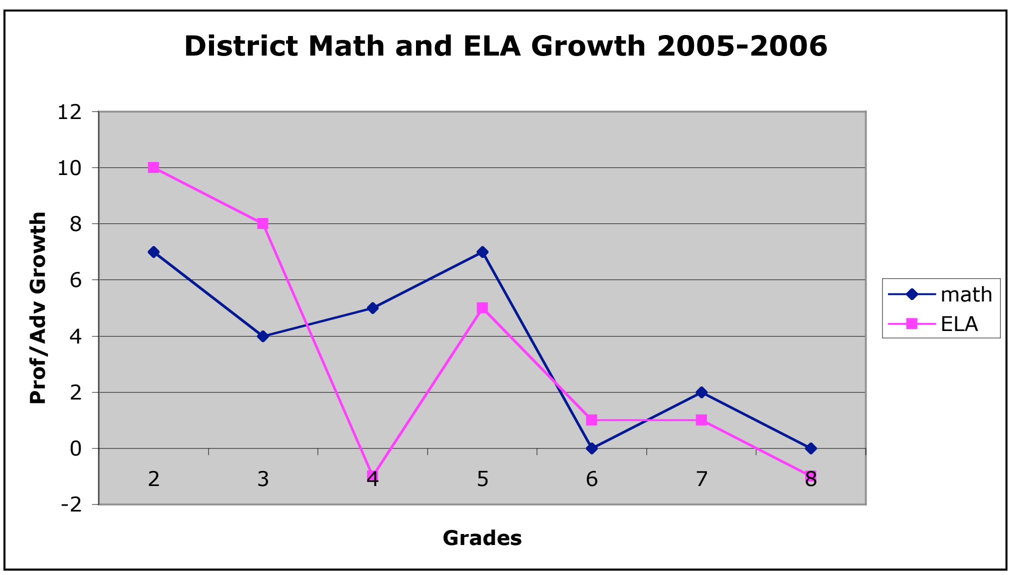


Figure 2

Elementary students showed greater growth than secondary. The greatest growth from 2005-2006 took place in 5th grade mathematics, where the average percent of students moving to

Advanced or Proficient was 7.3%. The 2005-2006 growth in math for grades 4 - 7 were not significantly correlated to the growth in 2004-2005, while a paired samples t-test showed that there was a significant correlation for growth in math for grades 2, 3, and 8 and in science for grade 5 (see Table 1). The two-tailed paired samples t- test for math in grades 2 and 3 and for science in grade 5 showed significance at $p \leq .01$. The two-tailed paired samples t-test for math in grade 8 showed significance at $p \leq .05$. The growth varied from school to school with one school's grade 2 students improving by as much as 31% in math and another school's grade 5 students improving by as much as 27%.

Table 1

Growth in Percent of Students Achieving Proficient or Advanced, 2005-2006

Grade Level	Number of students	Number of Schools	Mean	P value
2nd math	2506	23	6.8%	.009
3rd math	2507	23	1.6%	.005
4th math	2641	22	4.6%	NS
5th math	2603	22	7.3%	NS
6th math	2538	8	0%	NS
7th math	2362	8	2.4%	NS
8th Algebra I	1981	7	0%	.012
5th science	2598	22	6.95	.010

Most of the growth values for grades 6 and 8 can be attributed to 2 middle schools where one school had a growth of -30% in grade 6 and another had a growth of -34% in grade 8.

For 2005 -2006 the school district's growth in students achieving Proficient or Advanced scores in mathematics exceeded growth of both the State and the County at all the elementary levels but not for grades 6, 7, and 8. (see Table 2). The average growth in the State for grades 2-5 students achieving Proficient or Advanced in mathematics was 4% as compared with 5.75% growth in the school district. Similarly, students in the county of Los Angeles showed an average growth of 3.25% for grades 2-5 compared with the district's 5.75% growth. The growth of 2nd grade students moving to Proficient or Advanced in the school district was more than twice the growth for the state. Likewise, the school district exceeded LA county growth by a factor of 2 for 2nd and 3rd grade. By comparison, the average growth for grades 2 - 5 in English Language Arts was 5.5% in the district (anchored by large gains in grades 2 and 3), where the averages for the state and county were 3% and 3.75%, respectively.

Table 2

2005-2006 Growth in Students Achieving Proficient or Advanced: State, County and District

Grade Level	State of California	Los Angeles County	Unified School District
2nd math	3%	3%	7%
3rd math	4%	2%	4%
4th math	4%	4%	5%
5th math	5%	4%	7%
6th math	1%	1%	0%
7th math	4%	3%	2%
8th Algebra I	6%	8%	0%
5th science	4%	4%	5%

Figure 3 shows the growth for the district, county, and state in math.

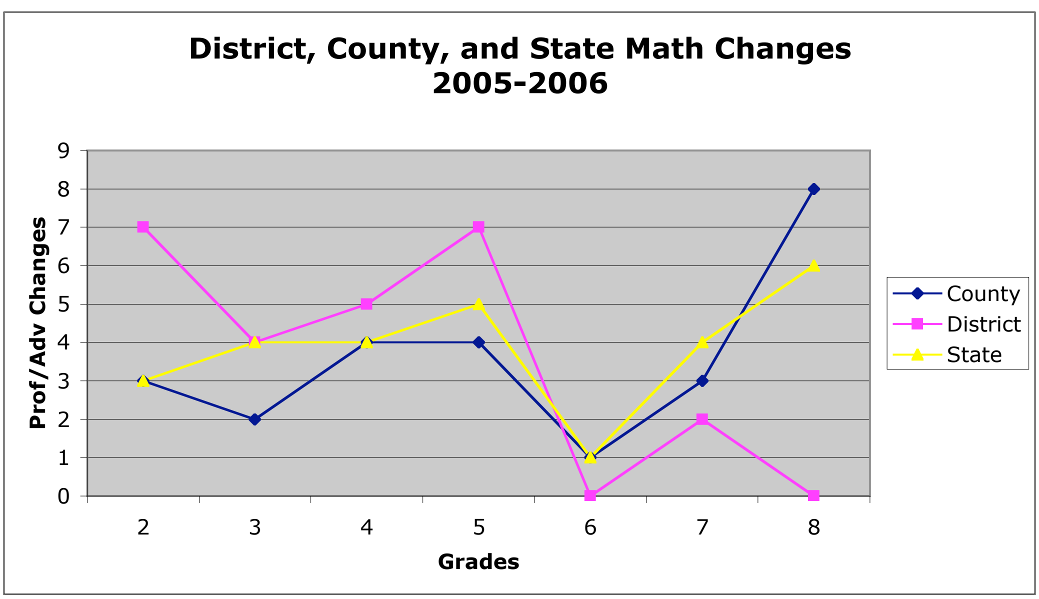


Figure 3

We also examined data to determine value added by the professional development intervention for the cohort of students in grade 2 in 2004, grade 3 in 2005, and grade 4 in 2006 (see Figure 4). Figure 4 shows that, for this cohort of students, their math growth exceeded their ELA growth for each year. The teachers at these grade levels received professional development in both subject areas. Math additionally provided curriculum guides and benchmark assessments.

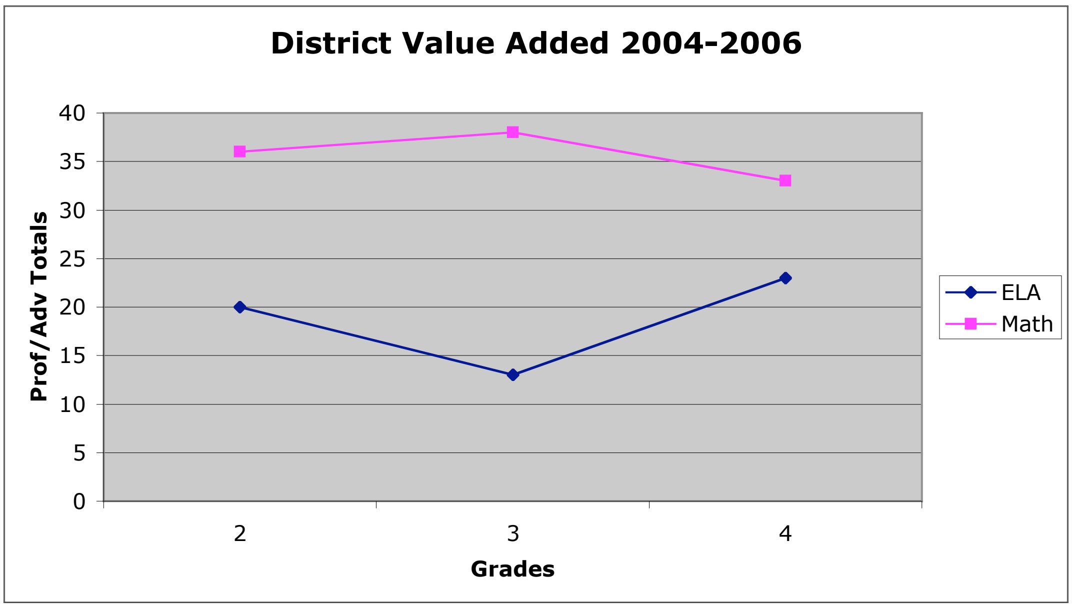


Figure 4

Figure 5 examines value added for another cohort of students: those in grade 3 in 2004, grade 4 in 2005, and grade 5 in 2006. This figure also shows that math growth consistently exceeds ELA growth for each year.

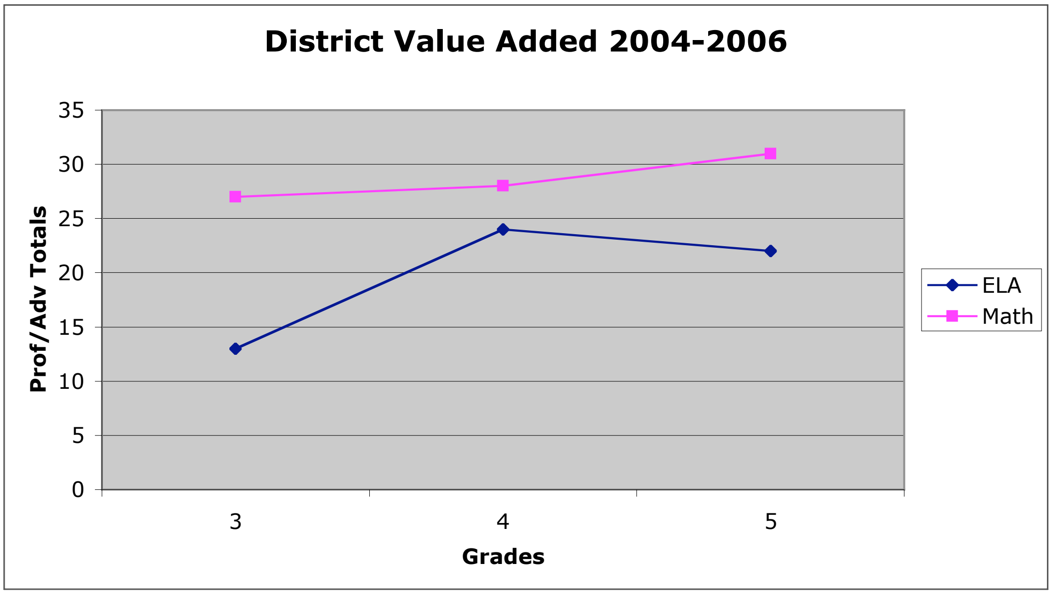
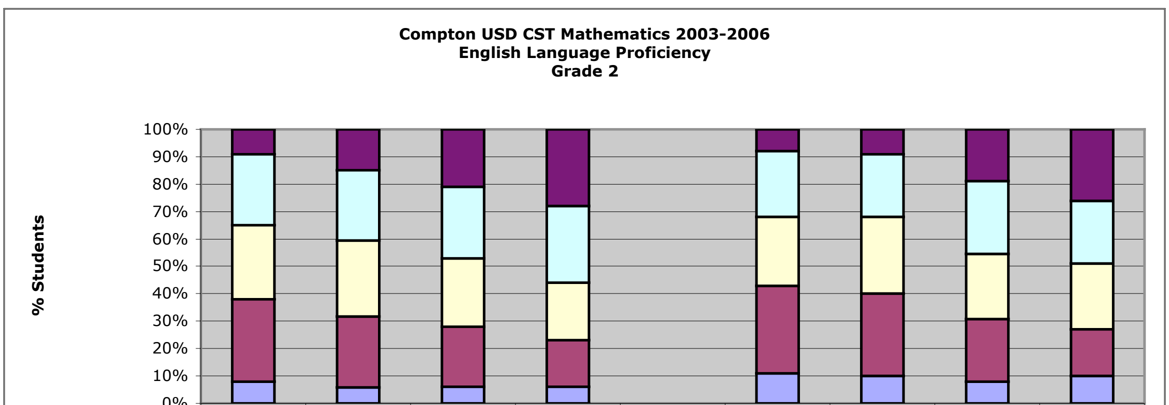


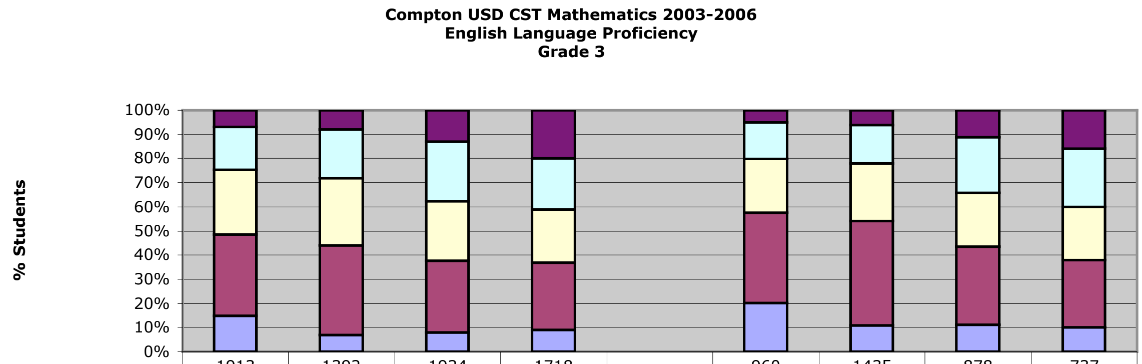
Figure 5

Figures 6-9 shows steady growth of grades 2 - 5 English Learners in math for 2003-2006.



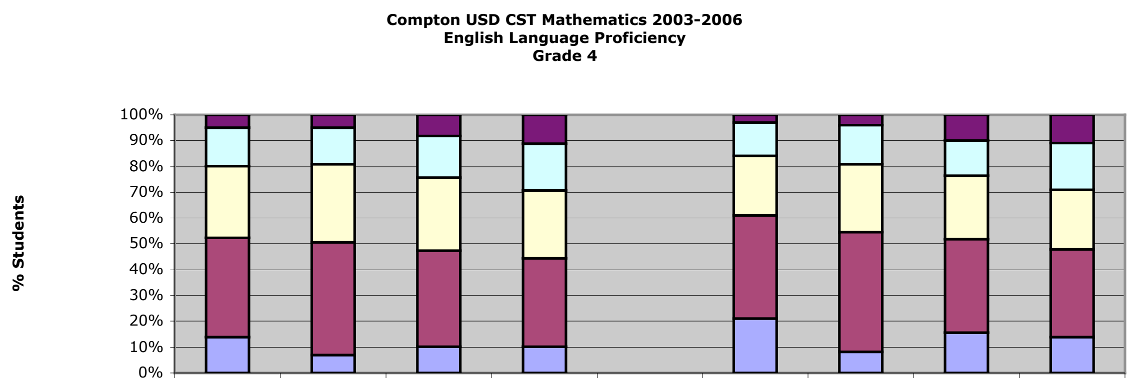
	English Learner					English Only			
	n=1811 2003	n=962 2004	n=1740 2005	n=1722 2006		n=964 2003	n=1950 2004	n=931 2005	n=759 2006
Advanced	9	15	21	28		8	9	19	26
Proficient	26	26	26	28		24	23	27	23
Basic	27	28	25	21		25	28	24	24
Below Basic	30	26	22	17		32	30	23	17
Far Below Basic	8	6	6	6		11	10	8	10

Figure 6



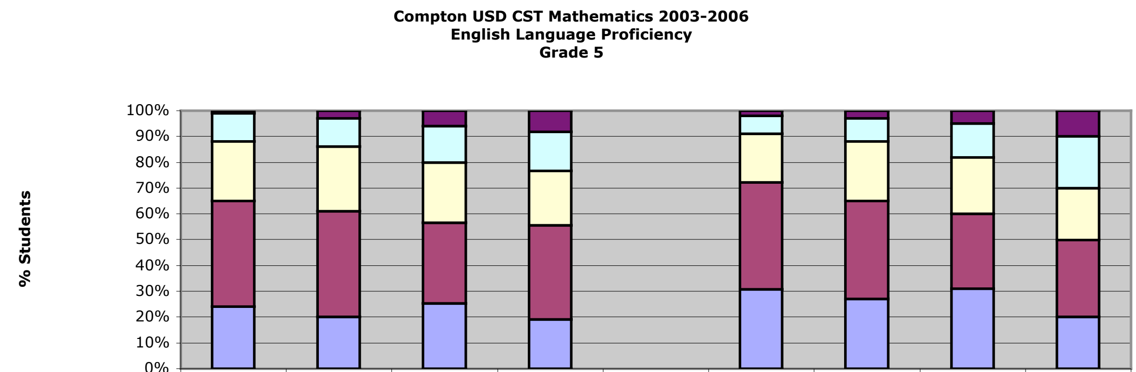
	English Learner					English Only			
	1913 n=1913 2003	1392 n=1392 2004	1924 n=1924 2005	1718 n=1718 2006		960 n=960 2003	1435 n=1435 2004	878 n=878 2005	737 n=737 2006
Advanced	7	8	13	20		5	6	11	16
Proficient	18	20	25	21		15	16	23	24
Basic	27	28	25	22		22	24	22	22
Below Basic	34	37	30	28		37	43	32	28
Far Below Basic	15	7	8	9		20	11	11	10

Figure 7



	English Learner					English Only			
	n=1605 2003	n=1505 2004	n=1494 2005	n=1690 2006		n=1013 2003	n=1315 2004	n=906 2005	n=730 2006
Advanced	5	5	8	11		3	4	10	11
Proficient	15	14	16	18		13	15	14	18
Basic	28	30	28	26		23	26	25	23
Below Basic	39	43	37	34		40	46	37	34
Far Below Basic	14	7	10	10		21	8	16	14

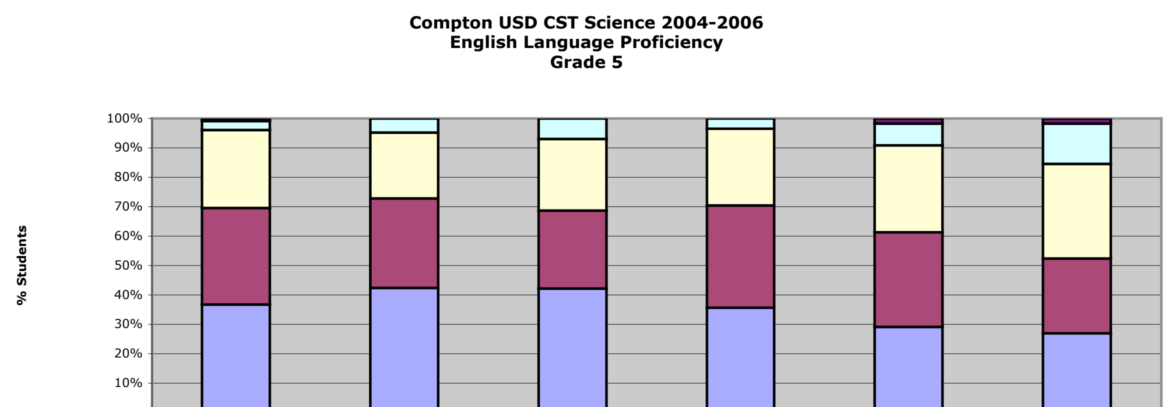
Figure 8



	English Learner					English Only			
	n=1644 2003	n=1311 2004	n=1595 2005	n=1426 2006		n=1058 2003	n=1223 2004	n=934 2005	n=776 2006
Advanced	1	3	6	8		2	3	5	10
Proficient	11	11	14	15		7	9	13	20
Basic	23	25	23	21		19	23	22	20
Below Basic	41	41	31	36		42	38	29	30
Far Below Basic	24	20	25	19		31	27	31	20

Figure 9

Figure 10 shows growth in science for grade 5 English Learners for 2004-2006 (there was no grade 5 CST in 2003).



	2004 English Learner	2005	2006	2004 English Only	2005	2006
Advanced	1	0	0	0	2	2
Proficient	4	6	9	4	8	15
Basic	33	29	31	31	32	35
Below Basic	41	39	34	41	35	28
Far Below Basic	45.8	54.3	54	42.3	31.7	29.4

Discussion

This report represents the second formal evaluation of a three-pronged mathematics and science educational intervention in a low-performing "Program Improvement District" in Southern California where many English Learners and low income students reside. As of the

2006 administration of the CST, the combined implementation of curriculum guides, quarterly assessments and professional development of teachers has coincided with a gain in student achievement in math. The school district has been showing a trend towards positive gains, but the mathematics gains are greater than growth in Language Arts in upper elementary (grades 4 and 5). Moreover, the gains in mathematics in grades 2 - 5 are greater than gains seen in the state and other parts of Los Angeles County.

The overall increase in student mathematics achievement in 2005-2006, particularly at the elementary level, was significant. The teachers and pupils in 2003-2005 had the same mathematics textbooks and resources available to them during this time as they did before intervention began. The coincidence of these gains and the implementation of the three-pronged intervention seem to be an indication of success, and other attempts to tie the level of success to specific dosages of professional development and the fidelity of implementation of the content standards and quarterly benchmarks are being pursued.

The gains in elementary math achievement in the 2005-2006 academic year did not match those of the 2004-2005 academic year but there were still gains. In several grade levels the gains were more than those achieved by students in 2003 before our project began its work in this district (5% in 2003).

In grade 5 science there is an added obstacle in that, because science is not tested in grades 2 - 4, principals do not encourage teaching science at these grades and teachers do not feel compelled to teach science. So the grade 5 teachers must provide quality instructional experiences that foster habits of mind without support and initial introduction in the lower grades. The grade 5 CST includes grade 4 physical, life, and earth science standards yet these often are not taught by the grade 4 teachers. So the gains in grade 5 are not as impressive as in math.

In Grade 6 the teachers are meeting in some schools to discuss their data and their curriculum guides. Their students take the benchmark assessments. But there was no gain in grade 6 overall. Of all the 6th grade teachers in the district, only 9 of them attended math professional development in 2005-2006. These 9 attended a total of 154.5 hours (ranging from 6 hours to 42 hours each). Three of the schools sent no participants and 4 sent only 1 participant to professional development. Only 1 middle school sent 3 participants but they attended only 6 hours each. Our project provided 30 hours of summer institute in 2005 and 30 hours of academic year professional development for a total of 60 hours. So the grade 6 teachers may have used the curriculum guides and benchmark assessments but not the professional development so they were missing one of the three components we believe support teachers and their students in attaining success in math: curriculum guides, benchmark assessments, and standards-based professional development.

In comparing the greater growth in student achievement of the elementary schools with that of the middle and high schools in this Unified School District, two major explanations occur to us. First, in all intervention studies, it may take a few years for the secondary schools to show significant improvement, as many of the elementary school students are now learning the standards for the first time and a pipeline must be created. Therefore, as elementary scores go up, it is assumed that better prepared students will be entering middle school and then high school, and those scores will eventually increase greatly as well. This will be a question for future research. In 2004-2005 inconsistent implementation of the curriculum guides at the secondary levels was an issue. In a few of the secondary schools, guides were not followed as written, due to local school autonomy. The district exerted more central intervention in 2005-2006 so that classroom instruction more closely matched benchmark assessments, but growth was still limited in grades 6-8 because of poor participation in attending professional development sessions with standards-based lessons and manipulatives. Professional development was offered as a component of the intervention because curriculum guides and benchmark assessments are necessary but not sufficient for improved student achievement. The better a teacher understands the standards, the more likely it is that his/her students will achieve proficiency. The better a teacher is informed about the best practices for using content guides and benchmark assessments, the better the gains should be.

As is evidenced both by the literature and the results, teachers who are involved in ongoing, on-site professional development that focuses on what students should know and be able to do are able to be more successful in teaching their students (Loucks-Horsley, Hewson, Love, & Stiles, 1998; Haycock, 1998; Desimone, Porter, Garet, Yoon, Birman, 2002; Guskey, 1986). To be useful to the teachers, professional development must be focused on the conceptual understanding of the standards and must include active learning opportunities. Furthermore, it must introduce teachers to specific instructional practices that incorporate research-based pedagogy known to be effective with low-performing students. Ideas learned through professional development must be incorporated into the curriculum guides so that teachers know when to effectively use strategies learned.

Implications

This study points out the utility of a three-pronged approach whereby districts may be able to improve their students' math and science achievement: standards-based curriculum guides with pacing timelines and specific student outcome objectives; standards-based benchmark assessments, correlated to statewide assessments, from which teachers receive timely, concrete, specific feedback about student progress toward learning; and ongoing standards-based professional development that is focused on specific instructional practices in an active learning setting.

Just knowing what to teach is not sufficient, however. Teachers must also have clear goals for what is to be taught and know how to judge the degree to which progress is being made towards those goals. Model tasks and performance objectives are important in helping teachers identify the meaning of the standards as well as the expectation of what mastery of the standard looks like.

There is a concern that teachers may be resistant to being told what to do; i.e., be given a pacing guide. However, as Guskey (1986) points out, activities that are successful tend to be repeated while those that are perceived as not being successful or for which there is no evidence of success are avoided. Therefore, when teachers are able to observe that their students are becoming more successful in the benchmark assessments, they are more likely to return to professional development and to implement the innovations that are presented there.

When the students who have achieved the math standards at the Proficient or Advanced levels arrive at the secondary schools (grades 6 -12), they will need qualified teachers so quality professional development will have increased importance at the secondary level in order that these students will continue to retain their conceptual understanding and will not regress in their knowledge of math. So professional development for teachers at this level is critical to sustain the growth of these students.

Work between teachers, district administration and an institute of higher learning is one hallmark of this study. The curriculum guides, benchmark assessments, and professional development were the result of a strong collaboration between our university and the school district. Teachers worked with project leadership to generate the guides and the assessments in both math and science. In addition, many teachers were involved in the revisions of the guides as well as in encouraging colleagues to attend professional development. The district bought the software to analyze the results. The district research and evaluation department processed the assessments and distributed the results in a timely way during the 2004 - 2005 school year. The district was very involved in determining the professional development their teachers received. Some of the teachers in the district have decided to deepen their involvement in professional development by becoming Professional Development Providers (PDPs). These teachers will work alongside our project to continue to provide instructional support for their colleagues during the academic year. One of the elementary principals arranged for the PDPs to provide professional development in math and science during the early release Wednesdays that the district mandated. The PDPs offered 3 after-school math and 2 science sessions for teachers at that elementary school. This cadre is the nucleus of a team of professional development providers that will be available to the district at the end of our project.

Now that this effort has seen the beginning of significant improvement in student achievement in math at the elementary level, the anticipation is that the district will continue its commitment to this work by further supporting its cadre of PDPs and by helping the IHE and teachers to continue to extend their efforts into science.

Further Study

Questions for further study might involve student achievement in future years. As more teachers attend professional development during the academic year, will there continue to be gains in students moving to Proficient or Advanced in next year's CST? Is there an upper limit to the growth? Will there be a decline in quality as the PDPs become the major providers of professional development? Will the growth seen in elementary grades be followed by a consistent pattern of growth in secondary schools during the next five years? Will this study replicate in other struggling districts? Can it be extended to other content areas? These and other questions will drive research and the refinement of this project. We are in place to extend the mathematics guides-benchmark-professional development system that was reported in this paper to another district in Southern California.

Appendix A

Saxon Math 1 Text Sections Which Do Not Address Course Standards

The following lessons cover topics not included in the California Standards for first grade mathematics; however, some cover standards for a different grade level.

Saxon Lesson	**Covers a standard for . . .**
1	Not specifically addressed
2	Grade K
4	Grade K
18	Grade 2
22	Grade K
25 (pt 2)	Not specifically addressed
26	Grade K
31	Grade K/3
35	Grade K
42	Grade 3
48	Grade K
55	Grade 2
57	Grade K
64	Not specifically addressed
65	Not specifically addressed
67	Grade 2
71	Grade 2
88	Grade 2
93	Grade 2

Saxon Lesson	**Covers a standard for . . .**
96	Grade 4
97	Grade 2
103	Not specifically addressed
104	Grade 2
107	Grade 2
109	Grade 2
112	Grade 2
113	Not specifically addressed
115 (pt 2)	Not specifically addressed
117 (pt 2)	Grade 2
119	Grade 2
120	Grade 2
122	Grade 2
124	Grade 3
128	Not specifically addressed
130	Grade 3
131	Grade 2
133	Grade 2
135	Not specifically addressed

Standards Not Addressed / Not Sufficiently Addressed

Part A: Standards Not Addressed in Saxon Math 1

MG 1.2.3 Give and follow directions about a location.

MG 1.2.4 Arrange and describe objects in space by proximity, position, and direction (e.g., near, far, below, above, up, down, behind, in front of, next to, left or right of).

Part B: Standards Not Sufficiently Addressed in Saxon Math 1 Lessons

NS 1.1.2* Compare and order whole numbers to 100 by using the symbols for less than, equal to, or greater than (<, =, >).

NS 1.1.3 Represent equivalent forms of the same number through the use of physical models, diagrams, and number expressions (to 20) (e.g., 8 may be represented as 4 + 4, 5 + 3, 2 + 2 + 2 + 2…)

NS 1.1.4 Count and group object in ones and tens (e.g., three groups of 10 and 4 equals 34, or 30 + 4).

NS 1.1.5 Identify and know the value of coins and show different combinations of coins that equal the same value.

NS1.2.2 * Use the inverse relationship between addition and subtraction to solve problems.*

NS1.2.5 * Show the meaning of addition (putting together, increasing) and subtraction (taking away, comparing, finding the difference).

NS 1.2.6 Solve addition and subtraction problems with one- and two-digit numbers.

NS 1.2.7 Find the sum of three one-digit numbers.

NS 1.3.1 Make reasonable estimates when comparing larger or smaller numbers.

AF1.1.1 Write and solve number sentences from problem situations that express relationships involving addition and subtraction.

AF 1.1.2 Understand the meaning of the symbols +, -, =.

AF 1.1.3 Create problem situations that might lead to given number sentences involving addition and subtraction.

MG 1.1.1 Compare the length, weight, and volume of two or more objects by using direct comparison or a nonstandard unit.

MG 1.1.2 Tell time to the nearest half-hour and relate time to events (e.g., before/ after, shorter/longer)..

MG 1.2.1 Identify, describe, and compare triangles, rectangles, squares, and circles, including the faces of three-dimensional objects.

MG 1.2.2 Classify familiar plane and solid objects by common attributes, such as color, position, shape, size, roundness, or number of corners, and explain which attributes are being used for classification.

SDAP 1.1.1 Sort objects and data by common attributes and describe the categories.

SDAP 1.2.1* Describe, extend, and explain ways to get to a next element in simple repeating patterns (e.g., rhythmic, numeric, color, and shape).

* Key Standard