2009 MSP Learning Network Conference
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General Info:

Abstract Name: Study of the Impact of Instructional Coaches on Middle School Teachers and Student Achievement

Author(s): Tom Corcoran, Henry May, Marian Robinson, CPRE

Presenter(s): M. Susana Navarro & Alicia Parra

Contact Person and e-mail: M. Susana Navarro (navarro@utep.edu)

MSP Project: El Paso Math/Science Partnership Program

Strand: [ ] Pre-Service [X] In-Service [ ] Recruitment, Induction, Retention
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[X] This abstract can be shared with MSP's Knowledge Management & Dissemination Project

Abstract:

1. Context of the work to be presented:

In 2002, the El Paso Collaborative for Academic Excellence at the University of Texas–El Paso was awarded an MSP Comprehensive Grant. As part of that grant, El Paso MSP worked with nine local school districts serving the El Paso region and the Region 19 Service Center to improve teaching and learning in middle grades and high school mathematics and science. One of the central strategies of the project was the provision of on-the-job assistance to teachers by instructional coaches, or staff developers.

Many reform support organizations and districts are using instructional coaches or on-site coaches to help teachers improve their practice and raise the performance levels of their students. For example, New York City has made sizable investments to support school-based math and literacy coaches and Boston has supported a cadre of coaches sponsored by a local education fund to stimulate reflective conversations about classroom practice. Most often, teachers with reputations for good teaching are recruited to work as coaches. And many simply pass on their personal craft knowledge to those with whom they work. In the last decade, new models have emerged that emphasize different aspects of the teacher-coach exchange, such as content knowledge, reflective inquiry, or teacher collaboration, each promoting different strategies for supporting individual or groups of teachers (Costa and Garmston, 2002; West and Staub, 2003). Although instructional coaching programs vary greatly in their purposes, workplace conditions, and goals, these instructional support staff share a common charge to stimulate and support improvements in instruction. Typically "coaches" help teachers build their knowledge and skill

by sharing and promoting discussion about good practices, and by engaging in observation, feedback, co-teaching, data analysis, and other collaborative efforts. Coaches may also help teachers use district-supported curriculum or implement packaged reforms.

There is a growing descriptive and empirical literature on the work of coaches that discusses some effective practices and the challenges coaches encounter as they work to change teachers' practice (Burney, Corcoran, and Lesnick, in press; Marsh, et al., 2008; Neufeld and Roper, 2003; Niedzwiecki, 2007; Schen, Sanjiv, and Dobles, 2005). As instructional coaching has become a major component of large-scale improvement initiatives that aim to influence classroom practice, increasing attention has focused on understanding the different contexts of coaching and how those contexts shape what coaches are able to do and accomplish in their work with teachers.

The MSP-Knowledge Management and Dissemination project conducted an extensive review of a set of studies on teacher leadership. In their synthesis, they noted that the work of teacher leaders "particularly when engaged in practices focused on classroom instruction, makes a difference in teachers' practice and suggests an impact on student outcomes" (MSP-KMD, 2008) Across the studies that examined the impact of teacher leaders' practice on teachers' practice, they found that "the amount and duration of teacher leader practices varied, suggesting that a larger context of conditions influences teachers' practices, beyond just what teacher leaders do." Finally, they noted that only "a few studies examined the relationship between teacher leaders' practice and student outcomes; findings from these studies suggest that a positive relationship exists."

The El Paso MSP work was designed in part to deepen understanding about similar issues related to the impact of instructional coaches. El Paso MSP contracted with the Consortium for Policy Research in Education (CPRE) to design and carry out a study of the impact of the work of the coaches on classroom practice and student performance in the middle grades. The study also addressed some critical issues about the provision of instructional support such as what general strategies were most effective, what kinds of professional development were useful to the staff developers, and how school conditions affected the work. This presentation shares findings from the study.

2. Claim(s) or hypothesis(es) examined in the work:

1. Well-prepared instructional coaches with strong math or science backgrounds and with a deep understanding of pedagogical content knowledge will have a positive impact on teacher practice and math/science student learning.
2. Instructional coaches whose work and roles are supported by school principals are more effective in impacting teacher instructional practice.
3. Students in classes taught by teachers who have worked intensively with an instructional coach will have significantly higher math/science achievement levels.

3. Evaluation and/or research design, data collection and analysis:

The research design for evaluating the impact of the El Paso MSP instructional coaches on teaching and learning involved multiple measures and analyses. Data from staff developers, teachers, principals, and students was linked in order to evaluate the degree to which the work of the coaches and related professional development under the El Paso MSP is associated with

changes in teachers' content and pedagogical knowledge, their instructional practices, their collaboration with peers, and ultimately, student performance. The following is a listing of the primary measures that were used in the study:

- Mathematics/Science Teacher Surveys
- Staff Developer Interviews
- Teacher Interviews
- Principal Interviews
- Measure of Pedagogical Content Knowledge for Teaching Mathematics
- Measures of Student Performance

Two teacher surveys were developed: a mathematics teacher survey and a science teacher survey. The teacher survey measured constructs including teachers' attitudes about student learning and effective teaching, their understanding and use of the curriculum frameworks, their use of specific teaching methods, their perceptions of principal leadership, their collaboration with other teachers, and their expectations for the achievement their students.

In developing these surveys, CPRE reviewed measures from previously published studies and current research studies that are directly relevant to our theory of action. The primary purpose of this review of other instruments was to identify existing sets of items that could be used on the El Paso surveys. The instruments and surveys reviewed included measures relevant to implementation of high-quality coaching (Camburn, Rowan, & Taylor, 2003), high-quality professional development (Garet, et al., 2001), and the use of formative assessments in differentiated instruction. CPRE also reviewed items that have been used in previous research to capture elements of schools as organizations, including items measuring instructional leadership of principals (Camburn, Rowan, & Taylor, 2003), instructional program coherence (Newmann, et al., 2001), and the strength of a school's professional community (Louis, Marks, & Kruse, 1996). CPRE examined items that had been used in previous research to measure various aspects of instruction and teacher quality in schools, including measures of teaching and curriculum enactment (Porter & Smithson, 2001), measures of teacher learning (Bryk, Camburn, & Louis, 1999). Sets of items selected in this review were adapted for use on the El Paso surveys where necessary, through rewording of items or elimination of items having less direct relevance. Although the numbers of items and scales selected from other instruments were significant, more than half of the items included on the El Paso surveys were developed specifically for this research.

Each staff developer was interviewed twice annually. These were extensive semi-structured interviews. Staff developers were asked open-ended questions, and then probed to provide detail and examples regarding their accomplishments, their strategies for working with teachers, their use of tools and evidence, their professional development, their workloads, and the challenges they faced during the school year. The baseline interview took place in August 2005 and focused on the staff developers' goals and expectations for their upcoming work in middle schools. Three follow-up interviews were conducted in May 2006, November 2006, and May 2007. A primary focus was placed on understanding the challenges to teaching at a high level of cognitive demand and the degree to which staff developers felt they had been successful in helping teachers do this.

Interviews of teachers focused on three main topics: an observed lesson, work with the staff developer, and school context. In terms of the lesson, interviews focused on teachers' selection of the content, their lesson design and the cognitive demand of the lesson, their choice of

instructional techniques, the student learning challenges they encountered and anticipated, and their assessment of student mastery. Teacher interviews also probed their views on the role of the staff developer, their interactions to date, and their assessments of the quality of the staff developers' support. A final set of questions focused on teachers' perspectives on the math and science instructional priorities of campus administrators, opportunities for professional development and external initiatives that shape their classroom practice. Each structured interview took about 30-40 minutes. A total of 184 interviews were conducted; in spite of repeated attempts, we were not able to interview two teachers.

In Fall 2005 and Spring 2007, interviews were conducted with principals to collect information about school context. Questions focused on major initiatives in math and science, perceptions of the value of the MSP partnership, and current working relationship with staff developers assigned to the school. It also elicited principal perceptions of the difficulties their students were encountering in math and science, hoped for changes in instruction, and their early assessment of interactions to date between teachers and staff developers. Interviews were conducted at the beginning and end of project, Fall 2005 and Spring 2007. A total of 28 interviews were conducted.

Mathematics teachers' content knowledge was measured through the Content Knowledge for Teaching Mathematics Measures, or pedagogical content knowledge (PCK), developed by Hill, Schilling and Ball, (2004). The PCK was designed to measure teachers' knowledge in three domains: (1) number concepts and operations, (2) patterns, functions, and algebra, and (3) geometry. All math teachers in MSP middle schools were invited to participate in a professional development session on February 11, 2006. A total of 120 teachers and seven staff developers attended.

Student achievement data in mathematics and science come from the Texas Assessment of Knowledge and Skills (TAKS). Mathematics test scores were obtained for individual students in grades 3 through 8 during 2003 through 2007. Science test scores were obtained for individual students in grade 5 during 2003 through 2007 and in grade 8 during 2006 and 2007.

Data Analysis

Data analysis involved linkage and triangulation of multiple sources of baseline, year-one, and year-two data in an effort to describe changes in instruction and student performance associated with the MSP program in middle schools. Most of the analyses used multilevel modeling techniques, such as Hierarchical Linear Modeling or HLM, and separate analyses to explore hypotheses posited by El Paso MSP.

The four main impact analyses were:

- First, an analysis conducted to determine the impact of the El Paso MSP instructional coaches on middle school math and science teacher practices. This included a quantitative analysis of the relationship between participation in professional development and changes in teacher practices and attitudes as measured by the teacher survey and as captured by classroom observations.
- Second, the impact of the EL Paso MSP coaches on middle school math teacher content knowledge was examined through the analysis of the results from the content knowledge measure. The statistical model for this analysis was a two-level HLM model with

teachers nested within schools. Pedagogical content knowledge scores from 2005 served as a pretest covariate for the 2007 scores, which served as the dependent variable.

- Third, two analyses were conducted to determine the impact of the El Paso MSP on middle school math and science achievement. The first linked student achievement data to teacher survey data to explore the links between annual student learning gains and the degree of participation by individual teachers in professional development provided by the coaches. The second analysis was longitudinal, employing a growth curve model to evaluate changes in student' rates of learning that were hypothesized to occur after the implementation of the MSP professional development program.
- Finally, an analysis of the factors which may mediate the impacts of the El Paso MSP instructional coaches was conducted. Data from principal and MSP director surveys were analyzed to determine the degree to which the relationships revealed in the aforementioned analyses are influenced by mediating factors such as the effectiveness of individual coaches as rated by MSP directors, concurrent reform activities in schools and districts, principal support and activities as instructional leaders, and general school conditions and context.

4. Evidence-based results for knowledge claim:

The El Paso MPS study of the Impact of Instructional Coaches on Middle School Teachers and Students has produced a rich data base on the effects of "instructional coaching" and the conditions under which it seems to produce strong effects. The major findings of the study are as follows:

- The practices and strategies of the coaches varied across schools and districts. Data from the logs and interviews revealed four distinct approaches among the 24 staff developers: Analyst (n=8), Proceduralist (n=4), Mentor (n=9), and Helper (n=3).
- Teaching practice improved in many of the classrooms in which the coaches were working, and it improved in the areas that they were focused on.
- Students taught by a science teacher who participated in intensive work with a coach scored 33 points higher on the Texas Assessment of Knowledge and Skills (TAKS) science test in 2007 than other students.
- The analyses of specific staff development activities and student achievement revealed that the core strategies of the MSP science coaches were significantly positively related to improved student performance in science during the 2006-07 school year.
- School contexts varied and influenced the work of the coaches; critical variables included principals' stance towards the availability and role of coaches; the school schedule and department meeting times; the professional culture of the school; and teachers' perceptions of their areas of need.
- Coaches reported differing levels of interest in and support for their work, as well as different approaches to structuring and managing their work by the district
- The application of the PCK survey to math teachers in 2006 and 2007 showed some significant growth in their pedagogical content knowledge, but that growth was not related to improvements in mathematics student achievement on TAKS.

Table 1. Relationships between Intensive Staff Development and Students' TAKS Performance in 2006-07

HLM Coefficient Estimate	Subject	
	Math	Science
Relative Performance Gain	-9.21	33.15***
Standard Error	(11.36)	(9.22)

Table 2. Relationships between Staff Development Activity and TAKS Performance

Staff Development Activity	School Year & Subject			
	Math		Science	
	2005-06	2006-07	2005-06	2006-07
Work with Individual Teachers				
Classroom Observation	0.98	-0.86	0.39	1.13~
Co-Lesson Planning	0.61	0.20	0.79	7.45***
Co-Teaching	0.60	0.10	0.21	2.39*
Data Analysis	2.81	1.46	21.62	3.29
Assessment	8.60	-5.30	6.89	-18.58
Debriefing/Reflection	0.96	0.68	3.15	1.57

Figure 1. Pedagogical Content Knowledge for Teaching Mathematics (PCK) Pre-Post Scores from February 2006 to May 2007 (N=45)

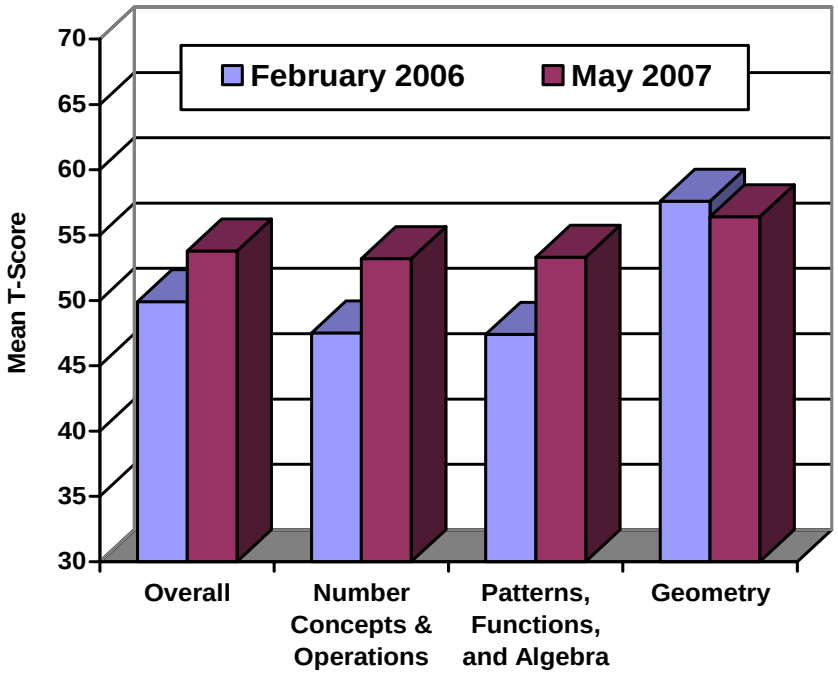

Table 3. Relationships between Teachers PCK Scores and Students' TAKS Performance in Math

HLM Predictor Variable	School Year	
	2005-06	2006-07
PCK Score	-1.09	-0.78
Gain in PCK Score		-0.08

Note: None of these estimates is statistically significant.

5. Conclusions and implications:

The MSP instructional coaches, or staff developers, were asked to do challenging work during a difficult period when there was heavy accountability pressure on the schools and teachers were focused on preparation for the state tests. The El Paso MSP, in cooperation with the three large districts and the Education Service Center-Region19, made a heavy investment in professional development for the coaches. Professional development for the coaches focused on strategies and tools that were closely related to their work, and most of them appreciated the training they received and made use of it. Even though their work situations differed in important ways and these differences combined with philosophical and style differences resulted in quite different approaches to the work, most of the coaches made use of the core set of skills, tools, and procedures that were provided through the El Paso MSP support.

What are the lessons learned from the El Paso experience with coaches? First, almost all of the staff developers praised those aspects of the professional development that were closely related to their work. But they were critical of things perceived as too theoretical or that seemed to be redundant or offer mere practice of skills they already possessed. The coaches' desire for more opportunity to learn from one another and to address common problems reflects their recognition of the problematic nature of their work and their desire to learn from their collective experience. Second, district and school contexts were strong influences on the work of coaches, either facilitating or inhibiting their work. With regard to district contexts, among the factors that influenced coaches effectiveness were the level of alignment between district initiatives and the MSP goals; the ways in which coaches' work was structured; and, the nature and intensity of extra district duties. At the school level, context factors included the extent to which the principal shaped and authorized the work of coaches; the culture of the school; the extent to which teacher/coach interaction was facilitated; and the characteristics of individual teachers. Third, a variety of strategies utilized by the coaches were linked to improved student performance. The work of science coaches with individual teachers, including classroom observation, co-lesson planning, and co-teaching, were all positively related to improved student performance. Work with groups of teachers including content training and classroom observation/debriefing in science was also positively related to higher student performance. Significant positive relationships with math performance were associated with providing feedback on a lesson (for 2005-06 only), reviewing the cognitive demand of a lesson (both years), and arranging for a teacher to observe another class (2006-07 only).

The analysis of the impact of the coaches' work on student performance produced noteworthy findings. As was mentioned previously, students taught by a science teacher, who worked intensively with a coach, performed significantly better on the TAKS than their peers in other classrooms. These results are especially encouraging given that teachers who were targeted for intensive staff development may have been the teachers who were less experienced or less effective to begin with. Another interesting finding is related to teachers' pedagogical

content knowledge. Results reveal that MSP work with teachers produced significant growth in their pedagogical content knowledge. That growth, however, was not related to improvements in mathematics student achievement on TAKS.

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