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Effectively coaching middle school teachers: A case for teacher and student learning

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ABSTRACT

In this paper we report findings from a two-year, large-scale research project that describes the work of middle school mathematics specialists (also referred to as mathematics coaches or instructional coaches) who served in 10 school districts. We use mixed methods to describe how mathematics specialists spent their time supporting teachers and how these supports contributed to meaningful changes that teachers made in their instructional practices. We also report results that correlate student achievement scores with whether or not teachers were highly engaged with the mathematics specialists. We coordinate these quantitative results with findings from several case studies to illustrate the qualitatively different ways that mathematics specialists supported teachers' ongoing work with their students. We also account for why some teachers participated more fully than others. Importantly, because mathematics specialists' work was situated in different school settings with different demands, resources and administrative supports, these constraints and affordances contributed in part to how they could effectively support teachers' work with their students.

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Over the past decade or so research has shown that when mathematics specialists (also known as mathematics coaches or instructional coaches) work successfully with teachers, teachers have opportunities to redesign or refine the school's mathematics program so that it aligns with best practices (e.g., Feiler, Heritage, & Gallimore, 2000; Hopkins, Ozimek, & Sweet, *this issue*; Knapp, *this issue*) and teachers have opportunities to develop new instructional strategies that support student learning (Feiler et al., 2000; Knapp, *this issue*; McGatha, 2008). In fact, when specialists and teachers work collaboratively to plan lessons, even when specialists modeled the lessons, teachers had opportunities to reflect on and make changes to their teaching (McGatha, 2008).

If teachers make instructional changes as a result of working with mathematics specialists, these changes may also have a positive effect on student learning. Indeed, some researchers have shown that students benefit when their teachers work closely and regularly with mathematics specialists (e.g., Feiler et al., 2000; Campbell & Malkus, 2011). Campbell and Malkus found that over time mathematics specialists have a statistically significant positive influence on student achievement in third, fourth, and fifth grades. The impact was evident after two years on the job with the increase in scores for students in schools with a trained mathematics specialist on average ten or more points higher on mathematics achievement tests when compared to students in schools without a mathematics specialist. In fact, the impact on student achievement increased as

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the mathematics specialists gained experience and as the specialists had more collaborations with school instructional and administrative staff.

There is a growing body of research about the impact that mathematics specialists can have both in promoting teacher professional learning and enhancing student learning. Our aim in this paper is to continue to support the case, along with other papers in this special issue, for the placement of and continued support for middle school mathematics specialists in school buildings. Here we provide a preliminary report of a two-year longitudinal study of middle school mathematics specialists in our state. As we do so, we also make an argument for the important ways middle school mathematics specialists provide “ongoing, in-house expertise to teachers who are striving to improve their teaching and their students’ learning” (Feiler et al., 2000, p. 66). Specifically, we will address the following questions:

1. How do mathematics specialists spend their time in middle schools?
2. Do they have an impact on teachers’ beliefs about teaching and learning mathematics?
3. Does the amount of time that specialists spend with teachers have an impact on student learning? And do the qualitatively different ways that they work with teachers have an impact on student learning?
4. What is the nature of the coaching relationship between teachers and specialists?

Mathematics specialists in our study, like those in Campbell and Malkus (2010, 2011), were placed in individual school buildings—they did not have regular classroom teaching responsibilities. Additionally, they were completing their third and final year in a graduate program to prepare them to be mathematics specialists when they were placed in their respective school buildings.

To address our research questions we use statistical methods to determine if teachers’ beliefs and student achievement (as measured by the state achievement tests) were influenced positively as a consequence of working regularly with mathematics specialists. Additionally, we use case study methodologies in an attempt to corroborate these findings to describe and possibly account for any significant changes in teachers’ beliefs and students’ learning. From a theoretical point of view, by coordinating these research approaches, we hope to develop a better understanding of the mathematics specialists’ daily work by interpreting and experientially grounding any claims and theories we might develop. From a practical standpoint, we explore the utility of developing a mixed-design research program to address our research questions.

We begin our discussion by explaining the framework that informed our interpretive stance and our research decisions. We then highlight the methodologies we used to report and synthesize our results. Following this discussion, we coordinate these findings with examples from the case studies to describe and account for the specialists and teachers’ shared goals for engaging in professional learning which, in turn, created communities that supported students’ mathematical learning. In the final section of the paper we provide some remarks about the project and the relevance of this work with regard to supporting and sustaining professional development (PD) models that engender professional dispositions that enhance school mathematics programs.

1. Interpretive framework

Because of the research questions we seek to answer, we draw on two educational theories to frame our interpretive stance. Since we are interested in teacher leadership, we use constructs associated with this body of work and coordinate these constructs with those associated with social learning theories to describe the settings in which the mathematics specialists worked, their work with teachers and the extent to which mathematics specialists successfully supported teachers’ and students’ learning.

1.1. Building professional learning communities

National Council of Supervisors of Mathematics’ [NCSM] (2008) PRIME leadership framework describes how mathematics teacher leaders evolve and become increasingly effective over time. This framework identifies four leadership principles: equity, teaching and learning, curriculum and assessment. They outline “stages” and indicators that describe how the mathematics teacher leader’s actions are couched in each of these principles. The second of these stages, “collaborating and implementing professional development and learning in order to improve [one’s] practice,” (NCSM, 2008, p. 29) is particularly relevant to our discussion here. In particular, the mathematics teacher leader provides appropriate opportunities for teachers to learn about and reflect on their practices. These leaders also have the important task of jointly establishing and sustaining learning communities in which they and classroom teachers collaborate together (NCSM, 2008). Like the *Principles and Standards for School Mathematics* authored by the National Council of Teachers of Mathematics [NCTM] (2000), this document is not prescriptive, but rather provides specific standards that outline what constitutes the mathematics specialists’ ongoing, purposeful and relevant work with teachers.

Educational researchers have different ways of interpreting and utilizing reform recommendations made by professional organizations. Fullan (2006), for instance, makes an argument that school reform efforts need to meet teachers where they are—in their classrooms. In order for leaders to effectively influence school, district and statewide instructional practices,

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