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## Abstract

**Purpose** – In the USA, school districts are funding mathematics coaching positions to provide school-level support to teachers. The purpose of this paper is to survey school personnel whose job responsibilities included mathematics coaching in order to examine their job responsibilities and what they felt that their job responsibilities should be.

**Design/methodology/approach** – In all, 67 elementary school mathematics coaches completed a survey that included 30 aspects of the job of elementary school mathematics leaders.

**Findings** – Quantitative analyses indicated that there were statistically significant differences between their actual roles and their preferred roles on 24 of the 30 items. This means that coaches reported that the aspects of their current role did not align to what they thought their job should be.

**Research limitations/implications** – The findings indicate a need to collect further information in a longitudinal study, potentially from a combination of surveys, interviews, and observations, about elementary mathematics coaches' job responsibilities and the impact that coaches have on both teachers and students.

**Practical implications** – The findings indicate a need for school leaders, mathematics leaders (coaches), and classroom teachers to work together to utilize mathematics leaders more effectively so as to best support teachers' instruction and students' learning.

**Originality/value** – While some research has been published on literacy coaching, the research base on mathematics coaching is scant. This study contributes to the knowledge base about the roles and duties of coaches in elementary school settings.

**Keywords** Elementary school, Mentoring, Professional development for teachers, Coaching, Mathematics, Elementary education

**Paper type** Research paper

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In the USA, the No Child Left Behind Act (NCLB) directs that every student in America's schools be taught by a "highly qualified teacher" (US Department of Education, 2004). However, continuing research indicates that many students, including those considered "most needy," continue to be taught by teachers with

inadequate content knowledge and skills, especially in all areas related to providing effective instruction in mathematics (Rosas and Campbell, 2010). More recently, the Common Core State Standards, adopted in 45 of 50 states, seek to improve achievement in mathematics by implementing standards that are rigorous, specific, learnable, and coherent (Chief Council of State School Officers, 2011). The Common Core State Standards include both the mathematics content to be taught at each grade level and eight mathematical practices that should be instilled in students. With these new standards becoming fully integrated into the curriculum, mathematics teachers need help defining how their instructional practices should change to become more effective in their classrooms (Polly and Hannafin, 2011; Russell, 2012). Instructional coaching has received attention both at the practical and theoretical level as a productive way to provide professional development that supports instruction and achieves high standards of student learning (Borko, 2004; Brondyk and Searby, 2013; Knight, 2007; Thornton, 2014).

## Effective professional development

The link between effective professional development and student achievement has become clearer in recent years; in fact, when teachers participate in effective opportunities for professional learning, their instruction and their students' achievement improves (McCollum *et al.*, 2013; Wei *et al.*, 2010). All too often, professional development programs require only passive involvement from teachers, such as a one-time lecture or demonstration of a new set of pedagogies. Following such a program, more often than not, teachers return to their classroom routines, applying little, if any of the in-service information to their own instructional practice (Polly and Hannafin, 2010; Kent, 2004; Steyn, 2005).

Large syntheses of research on teacher learning (e.g. Darling-Hammond *et al.*, 2009; Polly and Hannafin, 2011) suggest that professional development initiatives are most likely to be successful when they acknowledge and respect participants' existing beliefs and instructional practices, encourage collegiality, take place over an extended period of time, include follow-up sessions and adjustments to original plans, and offer teachers some ownership and choice of professional learning activities. In this context, academic coaches have great potential to effectively provide teachers' professional development and support their instruction (Charteris and Smardon, 2014), especially in elementary school mathematics (Polly and Hannafin, 2011; Polly, 2012).

### *Instructional coaching*

Research indicates that school-based, job-embedded professional development is preferred by educational leaders, coaches, and teachers (Neufeld and Roper, 2003). Further, these methods have been proven to be effective in increasing the theoretical and practical understanding the work of teachers (Knight, 2004, 2007; Lyons and Pinnell, 2001). Instructional coaching is "[…] a promising […] professional development practice in which teacher leaders [and other professionals] […] facilitate and guide content-focussed professional learning for a school's teachers" (Annenberg Institute for School Reform (AISR), 2004, p. 1).

While research on instructional coaching is scant, Cornett and Knight (2008) conducted a literature synthesis and found that three approaches to coaching have some empirical evidence of their positive impact: peer coaching (Bush, 1984; Maniace-Ireland, 2003; Showers, 1982, 1983, 1984); cognitive coaching (Hull *et al.*, 1998); and instructional coaching (Knight, 2004, 2007).

Knight and Cornett (2011) found that a coaching model used to provide follow-up support after a professional development workshop led to a higher instance of teachers' enacting new pedagogies compared to teachers who attended the workshop but did not participate in any coaching support. As one of their findings they called for more research to be focussed on the role of coaching and its impact on teachers' instruction and students' learning.

As curriculum standards and assessment mandates have changed in recent years, administrators, teachers and other professionals have been more frequently asked to support instructional practices and serve as coaches in establishing collaborative learning communities (Brondyk and Searby, 2013; Poglinco *et al.*, 2003). Literacy coaching has been a critical part of the literacy field (Bean, 2004; Bean *et al.*, 2008; Cassidy *et al.*, 2010; Hunt and Handsfield, 2013; Vanderburg and Stephens, 2010; Walpole and Blamey, 2008). While little attention has been given to mathematics coaching, the need for it is well documented (Campbell and Malkus, 2013; Polly *et al.*, 2013). For example, researchers have found that mathematics coaches are increasingly placed in elementary schools with the intent of providing knowledge to improve mathematics programs, serving as on-site resources for teachers, leading professional development to improve instructional effectiveness, and fostering a professional culture that will advance the achievement of students (Campbell and Malkus, 2010; Marzano *et al.*, 2005; York-Barr and Duke, 2004). While the Association of Mathematics Teacher Educators (2013) published a set of standards for Elementary Mathematics Specialists, a cohesive profile for what mathematics coaches do or should do has yet to be documented; and, what we know about coaching comes primarily from general reviews and literacy researchers.

Instructional coaching involves administrators, teacher leaders, teachers, or other education professionals examining practices and building alternatives to enhance teaching and learning (Knight, 2007). Effective instructional coaching includes: structure (e.g. goals that lead to improved outcomes, content focus, clear guidelines, data-based decision making); focus on adult learning (e.g. emphasis on evidence-based practices and continuous improvement); and leadership skills related to working with adults (e.g. data based, collaborative, and cooperative) (AISR, 2004). Mraz *et al.* (2009) identified four key roles for literacy coaches:

*Coach as content expert*

With their extensive knowledge of literacy theories and instructional expertise, coaches can serve as resources for teachers as they plan instruction, develop classroom management routines, select materials, and implement programs. Steiner and Kowal (2007) suggest that pedagogical knowledge, content knowledge, and interpersonal skills are three characteristics that identify effective coaches. Coaches must continually acquire relevant content knowledge and must work in conjunction with teachers to continue enriching this knowledge through reading, thoughtful inquiry, and refection (AISR, 2004). In mathematics education, the push for mathematics coaches across the world has been to provide content-specific expertise in mathematics rather than broad coaching from individuals who may lack the expertise to support the processes of mathematics teaching and learning (Neufeld and Roper, 2003).

*Coach as promoter of reflective instruction*

Coaches assist teachers in assessing the needs of students, reflecting on the effectiveness of their instructional practices, and refining those practices so the diverse

learning needs of students can be met. Ideally, assessment tools, both formal and informal, provide teachers with insight into a student's understanding of mathematical processes and this insight, in turn, informs instructional decisions that result in improved outcomes for all students (cf. Mraz *et al.*, 2009; Sailors and Shanklin, 2010). While coaches have potential to support reflective instruction, Ng (2012) noted that tensions arose in Singapore schools between coaches and teachers when their administrator assigned coaches to evaluate and appraise teachers while at the same time provide support through coaching and mentorship. Coaches should promote teachers' reflection, while at the same time providing a safe environment that promotes teachers' questions.

*Coach as professional development facilitator*

According to Joyce and Showers (2002), professional development should occur in the space where teachers work so that teachers can transfer their professional learning to their work with students. Academic coaches provide ongoing, teacher centered, embedded professional development in a classroom environment. As a result of supporting teachers daily in schools, coaches are able to scaffold their level of support to teachers, assistants, and other professionals by providing group or individual professional development (Blamey *et al.*, 2008). By working with individuals or small groups of teachers coaches can help with the implementation of theory into practice through modeling, co-teaching, observation, and feedback. Coaches must also be adept at observing and debriefing with classroom teachers to ensure effective implementation (Blamey *et al.*, 2008).

*Coach as builder of a school-wide learning community*

Coaches can play an integral role in developing and implementing a school-wide vision for instruction across the content areas (Dufour *et al.*, 2008). In order to create a shared vision of the school's academic programs and instructional philosophy, the academic leaders must work together with teachers, administrators, and other community constituents (Dufour *et al.*, 2008). Effective coaches know how to facilitate adult learning. Through leading professional development, modeling strategies, and conducting demonstration lessons, academic coaches assist teachers and administrators in becoming more knowledgeable about content-area instruction (Polly, 2012). Recently, dialogic coaching efforts have proven to be an effective way to promote teacher leadership and community building as teachers become co-learners and co-constructors of knowledge (Charteris and Smardon, 2014). On the other hand, coaches and mentors sometimes have their goals and progress impeded by school culture (Thornton, 2014).

## What we need to know

Despite the frequency of using coaches as part of schools' academic support teams, little is known about the roles these professionals fill in schools, especially in supporting mathematics teachers (AISR, 2004; Ng, 2012). Even basic elements such as titles and job descriptions vary widely from one school or district to another. Campbell and Malkus (2011) have empirically linked the presence of mathematics coaches to increased professional development opportunities for teachers and modest gains in student learning outcomes. However, the profession is just beginning to examine the various roles of mathematics coaches and the potential of these professionals and their specific activities to improve instruction and, in turn, student achievement. This research adds to that body of knowledge.

When used in ways that support instruction, such as assisting teachers with planning and teaching mathematics, studies on mathematics coaching illustrate that these professionals have a significant positive impact on teachers' instructional practices and student learning (Campbell and Malkus, 2011, in press). Studies have also found that job-embedded professional development that includes intensive planning and teaching support has also been associated with teachers' adoption of reform-based pedagogies in mathematics and gains in student learning (Orrill and Polly, 2012; Polly and Hannafin, 2011; Polly, 2012). Extending the work of Neufeld and Roper (2003), Campbell and Malkus (2011, p. 431) stated that "the function of the mathematics coach is to break the culture of teacher isolation whereby teachers work in private without observation or feedback and to collaborate with other professional development efforts in order to increase a school's instructional capacity."

However, there is very little empirically based research about the roles and responsibilities for mathematics coaches. Campbell and Malkus (2011) found that while mathematics coaches served in schools full-time they had very little interaction with teachers to support mathematics instruction. Those coaches who spent more time with teachers saw increased gains in teachers' adoption of reform-based mathematics pedagogies and gains on end-of-year mathematics achievement measures. Further research is needed to examine mathematics coaches' actual roles in their school and compare them to the extant literature on the roles and duties of effective coaches. This study examined elementary mathematics coaches' current roles and the roles that they thought they should have in order to better impact teaching and learning in their schools.

## Method

### *Purpose and research questions*

The purpose of this research was to explore perceived roles and responsibilities of professionals providing support for mathematics instruction in a large school district. For the purposes of this study, we refer to these individuals as mathematics coaches. We focussed on three questions related to their professional practices:

(1) What are the self-reported roles and responsibilities of school-based mathematics coaches for providing support for elementary school mathematics teachers?

(2) What do school-based mathematics coaches believe their roles and responsibilities should be in providing support for elementary school mathematics teachers?

(3) To what extent are reported and preferred roles and responsibilities similar for school-based mathematics coaches in regards to providing support for elementary school mathematics teachers?

We reasoned that documenting perceptions of practicing professionals engaged in providing support for mathematics teachers would add to what is already known and enhance continuing efforts to define and improve the emerging landscape of coaching in mathematics.

### *Participants*

The study included school personnel responsible for overseeing and supporting their school's elementary mathematics teachers in a large urban school district in the southeastern region of the USA. At the time of the study, the district had 98 elementary

schools serving a variety of different grades and ages, including schools with students from age five through ten or age five through 11 or from age five through 13.

Responses were received from 64 professionals, each of whom worked in a different school. Respondents identified themselves as a math facilitators (4.8 percent), math coaches (48.4 percent), academic facilitators/coaches (14.5 percent), or school administrators (32 percent). In this paper we use the word "coaches" to refer to the group of these individuals. These personnel reported working in schools teaching children from ages five to ten (65.6 percent), children from ages five to 11 (6.3 percent), or children from ages five to 13 (28.1 percent). This district has employed coaches focussed on literacy since the early 2000s. In some schools mathematics-specific coaches have been hired. However, in some schools academic facilitators/coaches who support both literacy and mathematics have been hired. In other cases, assistant principals or other administrative positions have been given coaching responsibilities.

While most of the respondents (45.3 percent) reported having ten to 20 years of experience in education, 29.7 percent had less than ten years and 25.0 percent had more than 20 years. Most of the respondents reported having ten to 20 years of experience in their current position in their current school, 21.9 percent reported six to ten years and 7.8 percent reported more than ten years of experience in their current position. Most of the respondents (70.3 percent) reported having less than five years, 21.9 percent reported six to ten years and 7.8 percent reported more than ten years of experience in their current position.

*Procedure*

Data were collected at a district-wide elementary professional development meeting that was attended by school personnel who were responsible for supporting and leading elementary mathematics teaching and learning for their school. Analyses of anonymous responses to a survey were compiled to answer our research questions.

*Instrumentation*. The survey (see the Appendix) was adapted from an instrument (cf. Mraz *et al.*, 2008) developed and used for similar research exploring perceived roles and responsibilities related to literacy coaching focussing on selected activities within five areas identified as exemplary by Bean *et al.* (2003). Respondents indicated the extent to which each item was currently part of the role they filled and the extent to which they believed that each behavior should be part of that role. We used a Likert-type scale on which a rating of five indicated that the behavior was something that they thought should be part of their job, and a rating of one indicated that they felt that the role should not be part of their job. The content validity of the survey was grounded in the evidential base for each item in previous research and reviews by experts in mathematics education. The internal reliability estimates (Cronbach's $\alpha$) for "currently part of role" and "should be part of role" ratings were 0.90 and 0.92, respectively.

*Design and data analysis*

We were interested in exploring similarities and differences in perceptions of roles and responsibilities of professionals providing support for mathematics instruction in a large school district. We compiled and analyzed descriptive and comparative summaries of survey results to address our research questions about the self-reported roles and responsibilities of school-based mathematics leaders. We used dependent *t*-tests to compare the mean differences between participants' perceptions of actual and preferred key features of mathematics coaching. We used the 0.05 level of statistical

significance for all comparisons and calculated 95 percent as indicators of the reliability and practical significance of our findings. The data were analyzed using Version 19 of SPSS Statistics for Windows (IBM, 2010).

## Results

Means, standard deviations, and comparison statistics for participants' responses across all survey items are provided in Table I. Participants' average ratings for all aspects of their job that were "currently part of role" ($M = 3.60$, SD = 0.60) and aspects that they reported "should be part of role" ($M = 4.07$, SD = 0.51) were statistically significantly different ($t = 4.59$, df = 41, $p < 0.01$).

As seen in Table I, seven items related to current roles and responsibilities had an average rating of 4.0 or higher on a scale of 1-5. By comparison, participants rated 21 items that they felt "should be part of their role" with a 4.0 or higher. One item was rated the lowest on both scales: share results of assessments with parents.

There was a statistically significant difference between participants' responses for aspects of their job that are "currently part of the role" compared to "should be part of the role" for 24 of the 30 items (Table I). For each item the average response for "currently part of the role" was lower than "should be part of the role," meaning that coaches felt they should be performing these roles more than they actually do.

## Discussion

The findings from this study address a gap in the literature about mathematics leaders and raise discussion points for future studies. We encourage readers to revisit Table I for the survey results. Many elementary school administrators have worked toward supporting teachers with leadership positions such as mathematics coaches (Campbell and Malkus, 2013). While these jobs involve supporting the teaching and learning of mathematics, the specific duties and descriptions of these positions vary greatly (Campbell and Malkus, 2011; Polly *et al.*, 2013). In order to critically examine the impact of school-based mathematics leaders there is a need to understand the expectations and exact roles of these positions (Polly, 2012). In what follows we discuss the main findings of our research as they relate to the three research questions set out earlier.

### *Participants reported differences between current job and desired role*

The elementary mathematics leaders who completed the survey indicated a statistically significant lack of alignment between their current role and their idea of what should be their role as an elementary mathematics leader. Further, there were statistically significant differences on 24 different aspects of their job, with the average significant differences varying from 1.24 points to 0.30 points.

The six aspects that were not statistically significant can be interpreted as either current parts of their role that they also feel should be part of their role or aspects that are not currently part of their role and which they do not feel that they should be. For example, for items on building professional relationships with teachers and administrators, participants rated both items high for their current role (4.67 and 4.64) should be part of their role (4.79 and 4.74). By contrast, coordinating schedules for grade level meetings was not rated highly in terms of their current role (2.90) or whether it should be part of their role (3.10).

For all 30 items, the average for "currently part of role" was lower than the average for "should be part of role." This finding suggests that the participants believed that

**Table I.**
Respondents' ratings of mathematics coaching features

| Statement | Currently part of role *M* | Currently part of role SD | Should be part of role *M* | Should be part of role SD | diff | 95% CI LL | 95% CI UL |
|---|---|---|---|---|---|---|---|
| 1. Informally discuss/share strategies and ideas that enhance mathematics instruction | 4.47 | 0.87 | 4.78 | 0.70 | 0.31 | −0.51 | −0.12* |
| 2. Facilitate formal, collaborative planning sessions on a regular or as needed basis | 4.31 | 1.14 | 4.69 | 0.83 | 0.38 | −0.68 | −0.07* |
| 3. Use leadership skills to improve mathematics programs by developing appropriate classroom learning environments | 3.52 | 1.28 | 4.27 | 0.92 | 0.75 | −1.06 | −0.43* |
| 4. Use leadership skills to improve mathematics programs by developing appropriate school-level learning environments | 3.54 | 1.24 | 4.30 | 0.89 | 0.76 | −1.05 | −0.47* |
| 5. Mentor new teachers to better serve students | 4.05 | 0.99 | 4.44 | 0.83 | 0.39 | −0.65 | −0.14* |
| 6. Mentor experienced teachers to better serve students | 3.65 | 1.19 | 4.24 | 0.84 | 0.59 | −0.85 | −0.34* |
| 7. Demonstrate how to use instructional strategies | 3.97 | 1.22 | 4.66 | 0.66 | 0.69 | −0.98 | −0.40* |
| 8. Conduct peer observations for the purpose of professional growth | 3.29 | 1.43 | 3.79 | 1.23 | 0.50 | −0.86 | −0.16* |
| 9. Lead study groups | 2.55 | 1.43 | 3.79 | 1.13 | 1.24 | −1.60 | −0.88* |
| 10. Use professional resources to inform critical issues related to mathematics teaching and learning | 3.32 | 1.24 | 4.22 | 0.87 | 0.90 | −1.18 | −0.63* |
| 11. Lead in-service workshops as a part of professional development | 4.03 | 1.18 | 4.61 | 0.59 | 0.58 | −0.87 | −0.27* |
| 12. Evaluate school-wide professional development programs | 2.98 | 1.38 | 3.80 | 1.12 | 0.82 | −1.19 | −0.45* |
| 13. Evaluate educational structures and policies that affect students' equitable access to high quality mathematics instruction | 2.63 | 1.25 | 3.67 | 1.33 | 1.04 | −1.37 | −0.73* |
| 14. Work closely with the principal in setting an agenda for and making decisions about faculty professional development | 3.75 | 1.23 | 4.45 | 0.69 | 0.70 | −1.01 | −0.40* |
| 15. Collaborate to create a shared vision for school improvement | 3.98 | 1.18 | 4.59 | 0.58 | 0.61 | −0.91 | −0.31* |
| 16. Collaborate to create an action plan for school improvement | 3.73 | 1.34 | 4.41 | 0.81 | 0.68 | −0.99 | −0.36* |
| 17. Partner with school-based professionals to improve each student's achievement | 3.98 | 1.02 | 4.44 | 0.65 | 0.46 | −0.73 | −0.19* |
| 18. Build professional relationships with teachers | 4.67 | 0.57 | 4.79 | 0.41 | 0.12 | −0.25 | 0.00 |
| 19. Build professional relationships with administrators | 4.64 | 0.71 | 4.74 | 0.48 | 0.10 | −0.24 | 0.04 |
| 20. Build professional relationships with community constituents | 3.65 | 1.23 | 4.17 | 0.91 | 0.52 | −0.79 | −0.25* |
| 21. Serve as a resource for families | 3.25 | 1.23 | 4.05 | 0.91 | 0.80 | −1.08 | −0.51* |

(*continued*)

Table I.

| Statement | Currently part of role *M* | Currently part of role SD | Should be part of role *M* | Should be part of role SD | diff | 95% CI LL | 95% CI UL |
|---|---|---|---|---|---|---|---|
| 22. Participate in curriculum development | 3.27 | 1.38 | 4.13 | 0.88 | 0.86 | −1.17 | −0.54* |
| 23. Assist in the selection of and locate new supplemental materials | 3.78 | 1.19 | 4.38 | 0.83 | 0.60 | −0.85 | −0.35* |
| 24. Coordinate schedules for grade level or content area team meeting | 2.90 | 1.49 | 3.10 | 1.38 | 0.20 | −0.56 | 0.17 |
| 25. Assist in the selection or development of assessment materials | 3.75 | 1.19 | 4.13 | 0.91 | 0.38 | −0.65 | −0.11* |
| 26. Conduct assessments for individuals or groups of students | 2.90 | 1.41 | 3.15 | 1.29 | 0.25 | −0.63 | 0.15 |
| 27. Assist in interpreting assessment data | 4.46 | 0.86 | 4.60 | 0.61 | 0.14 | −0.33 | 0.04 |
| 28. Coordinate assessment schedules | 2.98 | 1.36 | 3.03 | 1.24 | 0.05 | −0.31 | 0.21 |
| 29. Share results of assessments with parents | 1.87 | 1.03 | 2.18 | 1.08 | 0.31 | −0.54 | −0.09* |
| 30. Provide instruction for individuals or small groups of students, especially those identified as struggling in mathematics | 2.89 | 1.37 | 3.21 | 1.33 | 0.32 | −0.62 | −0.02* |

**Note:** *The difference is statistically significant if the 95 percent CI does not contain 0.0

what they were currently doing was appropriate and reasonable. This finding is positive as it indicates that leaders do not believe that there are any aspects of their job that should not be part of their role. This finding can also be interpreted to mean that the participants believe that they should be doing all parts of their job addressed in our survey.

Based on the research on mathematics coaches, district leaders and administrators have varied views on the role of mathematics leaders (Campbell and Malkus, 2011, 2013; Polly *et al.*, 2013). Similarly to literacy coaches, some of these differences are likely to stem from school contexts, in which elementary mathematics coaches often have a myriad of duties outside of mathematics coaching, or they have currently have a combined role of teaching students as well as coaching teachers (Polly *et al.*, 2013; Bean *et al.*, 2008; Fennell *et al.*, 2013).

*Implications for future research and improvement of practice*

This study was designed to explore elementary mathematics leaders' perceptions of aspects of their current role compared to what they feel that their role should be. Data analysis indicated a statistically significant lack of alignment between these two categories for 24 of the 30 aspects of elementary mathematics leaders. This lack of alignment brings to light some of the discrepancies between the aspects of elementary mathematics leaders' jobs and their ideas on how they can more effectively support mathematics teaching in their school.

While this study has statistically significant differences between coaches' actual roles and roles that they think that they should have, there are limitations in this study. While a survey allows the collection of data from a large number of participants the self-reported nature provides opportunity for coaches to interpret questions in their own way. For example, coaches may have rated things that "should be part of their role" high because they liked those duties, had high amounts of self-efficacy, or they felt they were the most beneficial to support mathematics teaching and learning. Future studies should include more data sources, such as interviews or open-ended sections for each part of their job to collect more information about coaches' rationale for their rating.

Future studies are needed to compare the perceptions of elementary mathematics coaches and leaders, classroom teachers, and school administrators to each other. Research that examines the perceptions of classroom teachers will provide an alternative perspective, specifically since the role of mathematics leaders is to support teachers' work in mathematics.

Likewise, administrators' perspectives will provide an alternative and account for their feelings about the role of elementary mathematics leaders in their school. Further, subsequent studies are needed to more closely examine the typical duties of elementary mathematics leaders and their impact on instruction as well as student achievement. While the large-scale work of Campbell and Malkus (2011, 2013) has started to answer this question, follow-up studies are needed.

In the mentoring field, researchers have called for more large-scale studies and analyses of mentoring and coaching programs (Frances, 2013). Further, some have called for research that helps to synthesize research on teacher mentoring from across the multiple fields and contexts in which this work occurs (Brondyk and Searby, 2013). Future studies that address these issues are clearly needed.

The present study has implications for practice, especially as administrators and district leaders continue to examine the most effective ways to leverage positions

focussed on leading mathematics instruction in elementary schools. The lack of alignment between aspects of mathematics leaders' jobs and the roles that these leaders thought they should have brings to light the need to reconcile the different opinions and perspectives between administrators who hire, and determine the roles of, these mathematics leaders and the leaders themselves. Thornton (2014) found that the schools' climates greatly influenced the work and impact of mentors.

Further, there is a need to continue to translate the research base about professional development into practice, especially focussing on how to best develop mathematics coaches' to support teachers' mathematics instruction. From the data there was evidence of some research-based professional learning activities taking place between the mathematics leaders and their teachers, such as supporting instructional planning and sharing instructional strategies. However, the data indicated that effective strategies such as leading study groups and evaluating professional development to make decisions were not part of the role of these mathematics leaders.

## Conclusion

This study provided insight into the perceptions of elementary school mathematics coaches in a large urban school district in the USA. Data analysis indicated a lack of alignment between coaches' perceptions of what their roles should be and their actual roles. In fact, there were statistically significant differences on 24 of the 30 items between coaches' actual roles and what they thought that their roles should include. The roles that had the largest discrepancy between roles that elementary mathematics coaches reported that they should have and their actual roles included leading study groups (1.24), evaluating educational structures and policies that affect students' equitable access to high quality mathematics instruction (1.04), and using professional resources to inform critical issues related to mathematics teaching and learning (0.90). Each of these roles relates to leadership and professional development duties, which coaches feel that should be part of the role, but are currently not part of their job.

Due to the paucity of research on the actual duties and impacts of mathematics coaches and the emphasis from mathematics education leaders for schools to fund and create mathematics coaching positions, there is a need for continuing research about the actual roles of elementary school mathematics coaches and the impact that they have on the teaching and learning processes in their school buildings (AISR, 2004; Poglinco *et al.*, 2003). Future studies should use multiple data sources and study coaches along with the teachers and students that they influence to examine comprehensively the impact of coaching as it relates to mathematics teaching and learning.

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## Appendix. Survey of Perceptions and Expectations for Mathematics Facilitators

*Please indicate the degree to which you believe the items listed below (1) Are currently part of the role of a mathematics facilitator and (2) Should be part of the role of the mathematics coach.*

*1 = **strongly believe** this **is not/should not be** part of the facilitator's role*
*2 = **believe** this **is not/should not be** part of the facilitator's role*
*3 = **neutral** on whether this is/should be part of the facilitator's role*
*4 = **believe** this **is/should be** part of the facilitator's role*
*5 = **strongly believe** this **is/should** be part of the facilitator's role*

| Statement | Currently Part of Your Role? | Should be Part of Your Role? |
|---|---|---|
| 1. Informally discuss/share strategies and ideas that enhance mathematics instruction | 1 2 3 4 5 | 1 2 3 4 5 |
| 2. Facilitate formal, collaborative planning sessions on a regular or as-needed basis | 1 2 3 4 5 | 1 2 3 4 5 |
| 3. Use leadership skills to improve mathematics programs by developing appropriate classroom learning environments | 1 2 3 4 5 | 1 2 3 4 5 |
| 4. Use leadership skills to improve mathematics programs by developing appropriate school-level learning environments | 1 2 3 4 5 | 1 2 3 4 5 |
| 5. Mentor new teachers to better serve students | 1 2 3 4 5 | 1 2 3 4 5 |
| 6. Mentor experienced teachers to better serve students | 1 2 3 4 5 | 1 2 3 4 5 |
| 7. Demonstrate how to use instructional strategies | 1 2 3 4 5 | 1 2 3 4 5 |
| 8. Conduct peer observations for the purpose of professional growth | 1 2 3 4 5 | 1 2 3 4 5 |
| 9. Lead study groups (e.g., read and discuss a professional book or article) | 1 2 3 4 5 | 1 2 3 4 5 |
| 10. Use professional resources (e.g. professional organization networks, professional journals) to inform critical issues related to mathematics teaching and learning | 1 2 3 4 5 | 1 2 3 4 5 |
| 11. Lead in-service workshops as part of professional development | 1 2 3 4 5 | 1 2 3 4 5 |
| 12. Evaluate school-wide professional development programs | 1 2 3 4 5 | 1 2 3 4 5 |
| 13. Evaluate educational structures and policies that affect students' equitable access to high quality mathematics instruction | 1 2 3 4 5 | 1 2 3 4 5 |
| 14. Work closely with the principals in setting an agenda for and making decisions about faculty professional development | 1 2 3 4 5 | 1 2 3 4 5 |

| | | |
|---|---|---|
| 15. Collaborate to create a shared vision for school improvement | 1 2 3 4 5 | 1 2 3 4 5 |
| 16. Collaborate to create an action plan for school improvement | 1 2 3 4 5 | 1 2 3 4 5 |
| 17. Partner with school-based professionals to improve each student's achievement | 1 2 3 4 5 | 1 2 3 4 5 |
| 18. Build professional relationships with | | |
| • Teachers | 1 2 3 4 5 | 1 2 3 4 5 |
| • Administrators | 1 2 3 4 5 | 1 2 3 4 5 |
| • Community constituents (e.g. families, policy makers) | 1 2 3 4 5 | 1 2 3 4 5 |
| 19. Serve as a resource for families (e.g. provide information on how families can support a student's mathematical development at home ) | 1 2 3 4 5 | 1 2 3 4 5 |
| 20. Participate in curriculum development | 1 2 3 4 5 | 1 2 3 4 5 |
| 21. Assist in the selection of and locate new supplemental instructional materials | 1 2 3 4 5 | 1 2 3 4 5 |
| 22. Coordinate schedules for grade level or content area team meetings | 1 2 3 4 5 | 1 2 3 4 5 |
| 23. Assist in the selection or development of assessment instruments | 1 2 3 4 5 | 1 2 3 4 5 |
| 24. Conduct assessments for individuals or groups of students (e.g. assess all entering first graders) | 1 2 3 4 5 | 1 2 3 4 5 |
| 25. Assist in interpreting assessment data | 1 2 3 4 5 | 1 2 3 4 5 |
| 26. Coordinate assessment schedules | 1 2 3 4 5 | 1 2 3 4 5 |
| 27. Share results of assessments with parents | 1 2 3 4 5 | 1 2 3 4 5 |
| 28. Provide instruction for individuals or small groups of students, especially those identified as struggling in mathematics | 1 2 3 4 5 | 1 2 3 4 5 |

*Occupational title* _____ *Number of years in this position* _____

*Number of years in the field of education* ___ *Grade or grade level range served* _____

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