Identifying Potentially Productive Coaching Activities

Lynsey K. Gibbons
115 Miller, Box 353600
University of Washington
Seattle, WA 98195-3600
Phone: 206-221-9220
Fax: 206-543-1237
Email: lgibbons@uw.edu

Biographical Statement:
Lynsey Gibbons is a research associate in mathematics education at the University of Washington. Her research seeks to understand how the contexts in which teachers work can be reorganized to support their ongoing learning and development, and how instructional leaders’ and professional educators’ practices support teachers’ development of high-quality mathematics instruction.

Paul Cobb
Email: paul.cobb@vanderbilt.edu
Phone: 615-343-1492

Biographical Statement:
Paul Cobb is Professor of Mathematics Education at Vanderbilt University. His research focuses on improving the quality of mathematics teaching and thus student learning on a large scale, and on issues of equity in students’ access to significant mathematical ideas.
Abstract

Instructional improvement initiatives in many districts include content-focused coaching as a primary form of job-embedded support for teachers. However, the current coaching literature provides little guidance about the types of activities in which coaches should engage teachers in order to support their development of ambitious instructional practices. Furthermore, when researchers do propose activities, they rarely justify why those activities might support teacher learning. In this article, we report a conceptual analysis in which we drew on the teacher learning and professional development literatures to identify types of activities that have the potential to support teachers in reorganizing their instructional practices. The findings delineate coaching practices that constitute goals for coaches learning, thereby informing the design of professional development for coaches and, more generally, school and district coaching policies.

Keywords: professional development, teacher learning, content-focused coaching, teacher leadership
Identifying Potentially Productive Coaching Activities

The core challenge that many schools and districts face is to better support students’ learning of significant disciplinary ideas by improving the quality of classroom instruction. The introduction of more conceptually oriented mathematics assessments in states that have adopted the Common Core State Standards requires most teachers to reorganize rather than merely extend or elaborate their current instructional practices (Snow-Renner & Lauer, 2005). Evidence from studies of teacher learning and professional development indicate the importance of teachers engaging in activities directly relevant to classroom practice with colleagues who have already developed more accomplished practices (Coburn & Russell, 2008; Louis, Marks, & Kruse, 1996). Many district reform initiatives include content-focused (or instructional) coaching in which teachers work with a more accomplished colleague as a primary form of job-embedded support (Coburn & Russell, 2008; McLaughlin & Talbert, 2006; Poglinco et al., 2003; Neufeld & Roper, 2003; Darling-Hammond, Wei, Andree, Richardson, & Orphanos, 2009). However, the current coaching literature provides little guidance as to the types of activities in which coaches should engage teachers in order to support teachers’ development of high-quality instructional practices. When researchers do propose types of activities, they rarely justify why those activities might be productive in supporting teachers’ development.

The purpose of our conceptual analysis is to address this gap in the research literature. We draw on the teacher learning and professional development literatures to identify types of coaching activities that have the potential to foster teachers’ development of ambitious instructional practices, thereby improving student learning. Although our focus is primarily on supporting mathematics teachers, we contend that the findings of this analysis have implications for content-focused coaching in other subject matter areas as well.

As a first step in presenting our conceptual analysis, we delineate an empirically grounded vision of high-quality instruction that constitutes the goal for teachers’ learning. The mathematics education research community has achieved a broad consensus on the forms of classroom instruction that support students’ attainment of ambitious learning goals. We then clarify the limitations of the existing literature on content-focused coaching and go on to identify a set of criteria for potentially productive coaching activities by drawing on the professional development literature. We then discuss the seven coaching activities that satisfy these criteria by explaining how each activity can support teacher learning and describing the critical role of the facilitator in each. Finally, we discuss the implications of our findings for future research on and for policy.

Supporting Teachers’ Development of Ambitious Practices

High-Quality Instruction in Mathematics

Over the past two decades, a number of prominent professional organizations have proposed ambitious goals for students’ mathematical learning and mathematics teaching (e.g., National Governor’s Association Center for Best Practices, & Council of Chief State School Officers, 2010; National Council of Teachers of Mathematics [NCTM], 1989, 2000). The goals for students’ learning emphasize both conceptual understanding and procedural fluency in a range of mathematical domains, using multiple representations, mathematical argumentation to communicate and justify mathematical ideas effectively, and productive dispositions towards mathematics (US Department of Education, 2008; Kilpatrick, Swafford & Findell, 2001; NCTM, 2000). These goals for student learning are demanding and have implications for appropriate forms of instruction that are justified in terms of student learning opportunities (Kazemi, Franke,
Ambitious teaching requires teachers to build on what students do as they attempt to solve challenging tasks while holding students accountable to learning goals (Kazemi et al., 2009). Recent research in mathematics education has begun to delineate a set of teaching practices that support students’ achievement of ambitious learning goals (Franke, Kazemi & Battey, 2007; NCTM, 2000). These practices include introducing challenging tasks without reducing the level of cognitive demand while simultaneously enabling all students to begin solving the tasks productively (Author, 2013), monitoring the range of solution strategies that students produce while working individually or in small groups (Horn, 2012; Lampert, 2001), and building on these strategies during a concluding whole-class discussion by pressing students to justify their reasoning and to make connections between their own and others’ solutions (Stein, Smith, Henningsen, & Silver, 2000).

These practices differ significantly from the current practices of most U.S. mathematics teachers, and their development involves reorganizing current practices (Snow-Renner & Lauer, 2005). The teacher learning involved encompasses mathematical content knowledge (Borko et al., 2011; Elliott, et al., 2009; Lo, Grant, & Flowers, 2008), mathematical knowledge for teaching (Suzuka et al., 2010), knowledge of student reasoning across mathematical domains (Kazemi & Franke, 2004), knowledge of curriculum (Ball, Thames, & Phelps, 2008), and enacting pedagogical routines that give rise to rich learning opportunities for students (Darling-Hammond et al., 2009). One key way to provide sustained support for teachers’ development of ambitious practices is through content-focused coaching.

**Content-Focused Coaching as a Form of Professional Development**

A recent report on teacher development in the U.S. indicates that school-based coaching programs are currently one of the fastest growing forms of professional development (Darling-Hammond et al., 2009). Content-focused coaching can be viewed as a form of apprenticeship in which less proficient teachers engage with a more accomplished colleague in activities that are directly relevant to classroom practice on an ongoing basis (Neufeld & Roper, 2003; Poglinco et al., 2003; West & Staub, 2003).

The current research base on content-focused coaching is relatively thin. Prior studies have examined the conditions in which content-focused coaching can support teachers’ learning (see for example, Cantrell & Hughes, 2008; Coburn & Russell, 2008; Mangin, 2007; Matsumura, Sartoris, Bickel, & Garnier, 2009). These studies indicate that principals play a crucial role in enabling coaches to be effective, and that understanding the coach’s role in supporting instructional improvement and publicly endorsing the coach’s work are both important. Other studies have investigated whether content-focused coaching supports teachers’ development of specific instructional practices, but the results of both these studies and of studies that have investigated the relation between content-focused coaching and student achievement are mixed (Campbell & Malkus, 2011; Cantrell & Hughes, 2008; Matsumura, Garnier, & Resnick, 2010; Sailors & Price, 2010).

For the most part, these prior studies have not attended to the types of activities in which coaches engage teachers. Further, when studies do document types of activities, they rarely consider whether the activities are productive by assessing teacher learning opportunities. We sought to address this limitation in the current research base by identifying a set of activities that,
when enacted effectively, can support teachers in reorganizing their instructional practices. To do so, we drew on what is known about high-quality professional development.

**Characteristics of High-Quality Professional Development**

Current reviews of the professional development literature indicate that researchers who have investigated teachers’ professional learning have made substantial progress over the last two decades in identifying characteristics of professional development that provide teachers with significant learning opportunities (Garet, Porter, Desimone, Birman, & Yoon, 2001; Putnam & Borko, 2000; Desimone, 2009; Wilson & Berne, 1999). We identified six characteristics of high-quality professional development by synthesizing both these seminal reviews and relevant studies included in the reviews. We selected the reviews by identifying reviews of professional development literature that were published in peer-reviewed journals and have been cited more than 700 times (based on Google Scholar). We then used the six characteristics as analytic criteria for selecting potentially high-quality activities in which coaches can engage teachers (see Figure 1 for a representation of the process of identifying potentially productive coaching activities).

The first characteristic of high-quality professional development is that learning opportunities must be intensive and ongoing. The findings of several studies indicate that teaching practices and student learning are unlikely to improve unless professional development is sustained (Desimone, 2009; Garet et al., 2001), thereby enabling the continued investigation of particular instructional issues and the opportunity to try out ideas in the classroom and reflect on the results (Kazemi & Hubbard, 2008; Gallucci, 2008; Little, 1982; Stein et al., 1999; Darling-Hammond et al., 2009).

Second, high-quality professional learning activities are integrated into teachers’ daily work and be relevant to the problems they encounter in the classroom (Franke et al., 2007; Gallucci, 2008; Kazemi & Franke, 2004; Little, 1982; Putnam & Borko, 2000; Stein et al., 1999; Wilson & Berne, 1999). Furthermore, there is evidence that professional development activities that focus teachers’ attention on their own students’ reasoning have strong positive effects on practice. It appears that by focusing on students’ reasoning, teachers consider how to elicit and build on their students’ mathematical thinking during upcoming instruction (Kazemi & Franke, 2008).

Third, high-quality professional development provides opportunities for teachers to develop a common professional discourse that names critical aspects of instructional practice and student learning (Ball & Cohen, 1999; McLaughlin & Talbert, 2006; Putnam & Borko, 2000). Ball and Cohen (1999) argue that the development of such a discourse is essential for productive discussions about teaching and learning.

A fourth characteristic is derived from the professional learning literature, that high-quality professional development provides opportunities to both investigate and enact specific pedagogical routines and practices (Grossman et al., 2009a; Grossman & McDonald, 2008) (note that we believe this details what is named ‘active learning’ in the professional development literature, Desimone, 2009; Garet et al., 2001). Pedagogies of investigation involve analyzing and critiquing artifacts and representations of classroom practice, such as classroom video-recordings and student work. Pedagogies of enactment involve planning for, rehearsing, and enacting high-leverage practices, thereby supporting teachers in translating the insights they have while engaging in pedagogies of investigation into practice.

Fifth, high-quality professional development fosters the development of teacher communities (Author, 2009; Darling-Hammond et al., 2009; Desimone, 2009; Garet et al., 2001;
Horn & Little, 2010; Kazemi & Hubbard, 2008; Putnam & Borko, 2000; Stein, Silver & Smith, 1999). Findings consistently indicate the importance of collaborative and collegial learning environments in promoting school instructional improvement (Darling-Hammond & McLaughlin, 1995; Knapp, 2003, Louis, et al., 1996). There is also strong evidence that professional communities can both support teachers in taking the risks necessary to reorganize their instructional practice, and result in a greater consistency in instruction (Horn & Little, 2010; Louis et al., 1996; McLaughlin & Talbert, 2006).

The sixth characteristic of high-quality professional development is that the professional learning activities include follow-up assistance to support the challenges of implementation (Garet et al., 2001; Guskey, 2000; Putnam & Borko, 2000). Findings indicate that effective professional development designs incorporate involve both classroom coaching and ongoing interactions with colleagues (Putnam & Borko, 2000).

We view the first four characteristics of high-quality professional development as essential and note that the resulting teacher learning opportunities can arise either as a group of teachers work together on problems of practice (the fifth characteristic) or while teachers receive support in their classrooms (the sixth characteristic). Below, we describe how we used the characteristics as criteria to identify potentially productive coaching activities.

**Identifying Potentially Productive Coaching Activities**

The first step in our analysis involved generating a comprehensive list of types of activities—in which coaches might engage either groups of teachers or individual teachers in their classrooms—by examining professional development, teacher learning, and coaching literature that included descriptions of the types of activities in which teachers engaged (Bean, Draper, Hall, Vandermolen, Zingmond, 2010; Darling-Hammond et al., 2009; Loucks-Horsley & Matsumoto, 1999; Poglinco et al., 2003). Our review of these reports resulted in a list of 15 activities that coaches could engage groups of teachers and 4 activities in which they could engage individual teachers. The group activities are: analyzing classroom video; analyzing test data; facilitating book study; conducting classroom visitations; co-designing instruction; compiling teacher portfolios; conducting action research; doing mathematics; examining student work; journaling about teaching experiences; engaging in lesson study; mapping the standards to the curriculum; leading one-time workshops about a particular teaching strategy or disciplinary idea; rehearsing aspects of instructional practice; and writing math tasks/developing curriculum. The individual activities are: enacting the coaching cycle; co-teaching; debriefing challenges of implementation; and modeling instruction.

We evaluated the potential of the 19 activities by assessing whether a high-quality enactment of each satisfied the six characteristics of high-quality professional development that we identified (see Appendix A for a table that lists all 19 of the activities and which characteristics we judged the activity had the potential to meet). We judged an activity as potentially productive if 1) it satisfied the first four essential characteristics (i.e., be ongoing, close to practice, support the development of professional discourse, and involve either a pedagogy of investigation or enactment), and 2) also met either the fifth or sixth characteristic (i.e., can be enacted either with a group of teachers or with individual teachers in their classrooms). As an illustration, we determined that the activity of examining student work is potentially productive because it can be ongoing, integrated into teachers’ daily work, foster a common language for describing students’ reasoning, is a pedagogy of investigation, and can be enacted by a group of teachers working together collaboratively. In contrast, although mapping
state standards to the instructional materials teachers are using can be integrated into daily work and might cultivate a professional discourse, it is unlikely to meet the other characteristics. Nine of the 19 coaching activities satisfied the two above criteria and were judged to be potentially effective.

As the next step in the analysis, we searched ERIC, Education Full Text, Google Scholar, and ProQuest Dissertations using as search terms each of the nine activity names (or related terms such as co-planning for co-designing instruction) in order to identify literature that investigated one or more of the nine potentially productive activities. This search yielded reports of more than 250 empirical studies conducted using a wide range of methodologies. We systematically reviewed the reports to determine whether and to what extent there was empirical evidence indicating that each activity supported teachers’ learning and documented what was learned. In the case of two of the activities, facilitating a book study and co-designing instruction, there was insufficient evidence of what teachers might learn. We therefore eliminated them from our analysis. Four of the remaining seven potentially productive coaching activities involve coaches working with groups of teachers: 1) doing mathematics, 2) examining student work, 3) analyzing classroom video, and 4) rehearsing aspects of practice. The remaining three activities involve coaches working with individual teachers: 5) co-teaching, 6) modeling, and 7) debriefing the challenges of implementation.

We next reviewed studies that focused on one or more of these seven activities to clarify both how a high-quality enactment of the activity can support teachers’ development of ambitious instructional practices and the facilitator’s role in enacting the activity at a high level. In the following pages, we report the findings of this review for each of the seven types of activities. In the space available, we aim to show how each activity met the four essential criteria, and either the fifth sixth criteria.

**Activities Conducted With Groups of Teachers**

**Engaging in Mathematics**

Engaging teachers in mathematics has featured prominently the professional development literature dialogue for over two decades. Substantial evidence indicates that teachers’ ability to make mathematics accessible and learnable by all students depends partly on their own mathematical knowledge (Suzuka, Sleep, Ball, Bass, Lewis & Thames, 2010). Hill et al. found that the relationship between teachers’ mathematical knowledge for teaching and their students’ mathematics achievement is significant (Hill, Rowen, & Ball, 2005). One avenue for supporting the development of teachers’ mathematical understandings and influencing how those understandings affect instruction is through exploring disciplinary content (Schifter, 1998). Below we synthesize findings from two major professional development initiatives in this area.

The first project was led by Schifter and colleagues, who examined the understandings on which elementary and middle-grades mathematics teachers drew in their classrooms after engaging in mathematics in a professional development setting (Schifter & Fosnot, 1993; Schifter, 1998). Thirty six teachers participated in professional development sessions spanned four years, including summer institutes, biweekly seminars, and biweekly classroom coaching. Schifter and colleagues found that teachers drew on new conceptions of doing mathematics (Schifter & Fosnot, 1993; Schifter, 1998). Schifter explains that teachers “experience mathematics, often for the first time, as an activity of construction, rather than as a finished body of results to be accepted, accumulated, and reproduced” (Schifter, 1998, p. 65). In one analysis, Schifter (1998) focused on two cases in which changes in the teachers’ beliefs about
mathematics led them to re-organize their classrooms around whole class inquiry into students’ mathematical ideas.

The second project, “Supporting the Transition from Arithmetic to Algebraic Reasoning,” was led by Borko (Borko et al., 2005; Clark & Borko, 2004). The intended outcomes of the project were to develop teachers’ understanding of key algebraic concepts and their knowledge about teaching algebra, and provide an opportunity for teachers to learn mathematics in a reform-oriented setting. Sixteen elementary and middle grades teachers attended a two-week institute and ongoing monthly meetings. Borko and colleagues’ comparison of pre- and post-assessments indicate that doing mathematics with a skilled facilitator resulted in modest gains in the participating teachers mathematical knowledge for teaching. (For additional studies that examine the development of teachers’ mathematical knowledge for teaching, see Ball et al., 2008; Elliott et al., 2009; Lo et al., 2008; Suzuka et al., 2010). Borko and colleagues also found that the participating teachers developed new instructional practices that centered on students explaining and justifying their reasoning (Borko et al., 2005; Clark & Borko, 2004).

Several recent studies have investigated what facilitators need to know and be able to do in order to support teachers’ learning. Borko et al. (2011) and Elliott et al. (2009) both concluded that effective facilitators delineate mathematically worthwhile goals for teachers’ learning and select tasks that are relevant for particular groups of teachers. In both studies, facilitators first supported teachers’ engagement with the selected tasks and then elicited teachers’ solutions and pressed them to question one another. Elliott et al. (2009) also reported that effective facilitators led productive discussions by intentionally “slowing down” conversations to focus explicitly on mathematical ideas, pressing teachers for explanations and justifications, and stepping back to make some of their practices as facilitators explicit.

In the studies reviewed above, teachers had an opportunity to meet at least monthly with one another and a more expert other to engage in doing mathematics together. The findings indicate that teachers began to develop a common language around the discipline and an enhanced understanding of how to represent disciplinary ideas. While there is evidence that doing mathematics as an activity can support teachers’ development of mathematical knowledge for teaching and influence their beliefs about what it means to do mathematics, possible links between these new understandings and improvements teachers’ instructional practices are less clear. More research is needed to clarify whether deeper mathematical knowledge for teaching results in improvements in teachers’ focus on students’ mathematical reasoning, interpretation of their mathematical ideas, identification of relationships between their thinking and learning goals, and orchestration of classroom discussions that build towards these goals.

Analyzing Student Work

Research conducted over the past 20 years indicates that teachers’ understanding of students’ mathematical thinking is integral to effective instruction (Carpenter, Fennema, & Franke, 1996; Schifter, 1998). Examining student work has been proposed as a primary activity for learning about student thinking (Carpenter et al., 1996; Author, 2009; Little, Gearhart, Curry & Kafka, 2003; Schifter & Fosnot, 1993). The studies reviewed below investigated how both teachers examined student work from their own classrooms, and took changes in group norms and in teachers’ discourse as evidence of teachers’ learning (Kazemi & Hubbard, 2008; Thompson et al., 2009; Windschitl, Thompson, Braaten, Stroupe, 2011). The findings indicate that the participating teachers had opportunities to learn how students’ understanding of
particular disciplinary ideas develops, and how to elicit and build on students’ thinking during instruction (Crockett, 2002; Kazemi & Hubbard, 2008; Zhao, 2011).

Franke et al. reported a series of studies in which they supported groups of elementary teachers’ learning about students’ mathematical reasoning (Franke & Kazemi, 2001; Kazemi & Franke, 2004). In these studies, teachers at an elementary school met monthly to examine their students’ mathematical work. The teachers used common problems in their classrooms and were supported to infer their students’ mathematical thinking using principles and terminology from *Cognitively Guided Instruction* (see Carpenter, Fennema, Franke, Levi, & Empson, 1999). In the course of this work, the teachers began to attend to the details of their students’ thinking, generated strategies for eliciting student thinking, and developed possible trajectories for instruction and student learning (see also Crockett, 2002). The researchers argued that these changes could support the development of instructional practices that focus on student thinking. However, they did not assess whether there were changes in practices.

Windschitl et al. conducted a series of studies with secondary science teachers in which the researchers led monthly teacher meetings that focused on the teachers’ instructional practices (Thompson et al., 2009; Windschitl et al., 2011). The teachers were supported to use a protocol for engaging in a cycle of inquiry, reflection, and action that included collecting and analyzing samples of their students’ written work. Windschitl and colleagues found that the participating teachers increasingly framed student work as evidence of student understanding and as a resource for instructional improvement. Similarly, Gearhart et al., 2006 found evidence that analyzing student work resulted in science teachers selecting tasks that were better aligned with their goals for student learning and that built on students’ thinking.

Most of the studies that we have cited emphasize the role of the facilitator in making the study of student work productive. In this regard, Little et al. (2003) examined three professional development programs that used student work and identified a number of facilitator practices that shaped the conversations. These practices included clarifying the purpose of examining student work in advance and purposefully selecting student work samples in light of their goals for teachers’ learning. In addition, facilitators supported teachers in situating the focal lesson within an encompassing instructional sequence and oriented them to focus on understanding students’ thinking rather than merely evaluate their solutions (Author, 2009; Little et al., 2003). This orienting work involved pressing teachers to consider (a) what students did to solve the problem, (b) why they solved it in particular ways, and (c) what their strategies revealed about their understanding of key ideas (Zhao, 2011). The findings of the reviewed studies also indicate that effective facilitation involves supporting teachers to generate questions that can elicit students’ thinking during instruction, determine which strategies to highlight in whole class discussions, and consider future goals for students’ learning (Gearhart et al., 2006; Kazemi & Franke, 2004; Thompson et al., 2009; Zhao, 2011).

The teachers who participated in these studies met at least monthly and a more expert other guided their efforts to analyze and critique student work from their own classrooms. The findings indicate that the teachers began to develop both a common language for describing student understanding and routines for developing common tasks and for eliciting student thinking. Furthermore, researchers who conducted these studies identified a set of facilitator practices and protocols that supported productive conversations. Although these findings suggest that examining student work might influence classroom practice, this link was only investigated in the Windschitl et al. study (2011). Future research is therefore needed to examine this possibility by focusing on both how teachers analyze their students’ thinking in the course of
teaching and the extent to which they link their students’ current ideas to disciplinary learning goals.

Analyzing Classroom Video

The use of classroom video as a representation of practice has become increasingly common in professional development and teacher education in recent years (Borko, Jacobs, Eiteljorg, & Pittman, 2008; and Sherin, 2004). A typical goal of analyzing classroom video is to orient teachers away from unfocused explorations of what transpired in a classroom (Ball & Cohen, 1999) and towards an evidence-based analysis of how classroom activities and interactions support students’ learning (Borko et al., 2008; Rosaen, Lundeberg, Cooper, Fritzen, & Terpstra, 2008). The studies discussed in this section primarily involved teachers analyzing video from their own or their colleagues’ classrooms (see Zhang, Lundeberg, Koehler & Eberhardt, 2011, for an examination of using commercially produced video).

Sherin and her colleagues conducted a series of studies that examined the “Video Club” professional development model in which university mathematics educators supported a group of elementary teachers from an urban school as they viewed and discussed excerpts of videos from their classrooms in 10 sessions over the course of a year (Sherin & Han, 2004; Sherin, 2004; van Es & Sherin, 2008; van Es & Sherin, 2010). During the sessions, the facilitators supported teachers in using evidence from video segments to support their claims about the students’ mathematical understandings. The participating teachers’ analyses shifted from an initial focus on classroom management to student mathematical thinking, with increased discussion of the importance of attending to student ideas during instruction (van Es & Sherin, 2008; see also Borko, 2004; Borko et al., 2005; Borko et al., 2010; Clark & Borko, 2004; Rosaen et al., 2008). van Es and Sherin (2010) examined the teachers’ classroom practices and found an increase in the extent to which teachers supported students in making their thinking public, elicited multiple strategies from students, and probed students’ underlying understandings.

Although the findings from these studies are encouraging, it is also clear that teachers do not necessarily gain new insights about practice merely from watching classroom videos (Brophy, 2004). It appears essential that the facilitator first establish a clear purpose for viewing the video that is based on specific goals for teachers’ learning (Borko et al., 2008; Brophy, 2004). In this regard, Borko et al. (2008) found that effective facilitators considered questions such as: What focus would stimulate discussion of key instructional issues? Which specific video clips would help make particular points? Facilitators who addressed these questions when planning for and leading sessions were better prepared to build on teachers’ contributions.

Another aspect of effective facilitation is to support teachers in understanding the classroom context when introducing a clip. Borko et al. (2008) clarified that key contextual features include (a) the instructional goals for and mathematical tasks used during the lesson, (b) student characteristics, and (c) the place of the lesson in a larger instructional sequence. Additionally, the Borko and colleagues (2008) found that effective facilitators posed structured discussion questions and routinely pressed the group to take a more critical look at the videoed teacher’s practices (e.g., “How did the teacher’s questions help him to understand how Kaitlin derived her expression?”, p. 428). There is evidence that this press on relations between instructional practice and student thinking supports teachers in explaining students’ contributions (Sherin & Han, 2004), inferring possible reasons for the videoed teacher’s instructional decisions (Sherin, 2004), and formulating questions that uncover student thinking (Borko et al., 2008).
In the studies reviewed here, skilled facilitators supported groups of teachers in examining video of their instruction. The studies provide evidence that the teachers began to develop a common language for talking about student mathematical thinking and to attend to their students’ thinking during instruction. van Es and Sherin’s (2010) findings indicate that the participating teachers increasingly elicited students’ explanations and probed students’ underlying understandings. Borko and colleagues (2008) identified a set of productive facilitator practices, such as identifying video clips that can be used to make particular aspects of practice apparent for teachers. Additional research is necessary to clarify further the relations between analyzing video and improvements in classroom instruction, how accomplished facilitators make decisions about the aspects of practice on which to focus with particular group of teachers, and the types of facilitation practices that can initiate and guide productive discussions that address the participating teachers’ current needs.

Rehearsing High Leverage Practices

As we have noted, Grossman and colleagues distinguish between two important types of professional development activities: pedagogies of investigation and pedagogies of enactment (Grossman et al., 2009a; Grossman, Hammerness, & McDonald, 2009b; Grossman & McDonald, 2008). Pedagogies of investigation involve analyzing and critiquing representations of practice whereas pedagogies of enactment involve planning for, rehearsing, and enacting specific instructional practices in a graduated sequence of increasingly complex settings. In recent years, researchers who have investigate teachers’ learning have focused on rehearsing as a primary means of supporting teachers’ development high-leverage practices (e.g., launching cognitively demanding tasks) (Kazemi, et al., 2009; Lampert & Graziani, 2009; Lampert, et al., 2013).

Rehearsals approximate full responsibility for supporting students’ learning while providing teachers with opportunities to try out specific practices and receive feedback from colleagues and a facilitator that can guide the refinement of the practices (see Kazemi, et al., 2009; Lampert, et al., 2013; Lampert & Graziani, 2009). Lampert and colleagues conducted an analysis of 90 rehearsals conducted in elementary mathematics methods courses in order to understand the novice teachers’ opportunities to learn to enact particular aspects of ambitious instruction, such as eliciting and responding to students’ explanations for their solutions (Lampert et al., 2013). They found that rehearsing supported the development of both their understanding of and enactment of the focal practices.

Lampert and colleagues also clarified that important aspects of the facilitator’s role include guiding the establishment of norms for participating in rehearsals, responding as a student in order to surface common implementation problems and student misconceptions, and pressing teachers to make sense of and respond to “student” ideas and consider the actions that they might take in such a situation (Kazemi, et al., 2009; Lampert & Graziani, 2009; Lampert, et al., 2013). In the course of this work, Lampert and colleagues identified examples of potentially productive facilitator interjections (e.g., “What if someone said 101 [an incorrect answer] instead of 110? How would you deal with that?”) (Lampert, et al., 2013, p. 232).

In the reviewed studies, pre-service teachers enacted specific instructional practices in a graduated sequence of increasingly complex settings with feedback from a skilled facilitator. The studies provide some evidence that the novice teachers deepened their understanding of specific practices, developed a common language for describing practice, and enacted particular practices in an increasingly accomplished manner. Further research is needed to understand how this activity can be used to support in-service teachers’ development of ambitious instructional
COACHING ACTIVITIES 12

practices. In contrast to pre-service settings, practicing teachers work with entire classes on an ongoing basis. It is therefore important to investigate how Lampert and colleagues’ design can be adapted productively to in-service settings. Important issues include negotiating aspects of the participating teachers’ current practices on which to focus, developing the norms of sharing problems of practice and of critiquing each others’ attempts to enact focal practices constructively, and coordinating rehearsals with teachers’ ongoing instruction.

Activities Conducted One-on-One with Teachers in Their Classrooms

The activities we have discussed thus far involve coaches working with groups of teachers. Another group of studies that we examined investigated the provision of support for teachers in their classrooms. As stated previously, ongoing follow-up support is a characteristic of effective professional learning (Garet, et al., 2001; Guskey, 2000; Putnam & Borko, 2000). One-on-one coaching activities that appear to be potentially productive include: (a) co-teaching, (b) modeling, (c) observing and debriefing challenges of implementation. Although these activities appear frequently in the coaching literature, they are rarely justified in terms of their potential to support teachers’ development of ambitious practices (Bean et al., 2010; Neufeld & Roper, 2003; Poglinco et al., 2003).

Co-teaching

Researchers who have examined how people develop complex professional practices have emphasized the importance of co-participating in a practice with a more knowledgeable other (Brown, Stein, & Forman, 1996; Lave & Wenger, 1991; Roth & McRobbie, 1999). Tharp and Gallimore (1988) argued that co-participation supports the learner in ways that language alone cannot do: “the development of common understanding of purposes and meanings of the activity, [and] the joint engagement in cognitive strategies and problem solving are all aspects of interaction that influence each participant” (p. 89). Through co-participation, the more knowledgeable other works alongside a less accomplished teacher in authentic situations, and they both influence classroom events and then negotiate interpretations of these events (Roth & McRobbie, 1999).

Very few studies have investigated the conditions under which co-teaching is productive in supporting K-12 teachers’ learning. However, a number of studies have focused on co-teaching as a support in either teacher education or teacher induction1 (Eick & Dias, 2005; Eick, Ware, & Williams, 2003; Roth & McRobbie, 1999; Roth, Masciotra, & Boyd, 1999; Scantlebury, Gallo-Fox, & Wassell, 2008; Tobin & Roth, 2006). Co-teaching is typically defined as a novice teacher engaging in classroom teaching experiences with a mentor teacher and then discussing what transpired during the lesson in a follow-up meeting.

Eick and colleagues examined how co-teaching with experienced teachers influenced the knowledge and practices of ten secondary science student teachers over an eight-week period (Eick & Dias, 2005; Eick, et al., 2003). The student teachers were paired with mentor teachers for two consecutive periods. During the first period, student teachers observed and assisted the mentor teacher by working with small groups or individual students. Throughout the second period, the student teachers taught the same lesson and the mentor teachers providing assistance. Most of the student teachers reported that they felt supported when they took the lead and attempted to implement specific instructional practices (e.g., questioning strategies) and manage the classroom (see also Roth, Masciotra, & Boyd, 1999). During the debriefing conversations,

1 For each teacher education study cited, we used the authors’ original terminology to refer to the new teacher (e.g., ‘novice teacher’ or ‘student teacher’) and supporting teacher (e.g., ‘mentor teacher’ or ‘cooperating teacher’).
student teachers reported discussing the effectiveness of the instruction and implications for students’ learning.

Eick and colleagues’ (2003) examined how the mentors supported the student teachers and found that assistance during instruction included logistical support (e.g., assisting with the setting up the materials needed for the lesson) and ongoing verbal interjections throughout the lesson (e.g., asking students questions to help the student teacher assess students’ understanding). Eick and colleagues argued that the mentors’ co-teaching interventions and the in-depth verbal and written feedback they provided after the lesson supported the student teachers in learning to support students’ understanding of scientific ideas.

The studies reviewed here provide evidence that co-teaching can support student teachers to implement specific instructional practices and manage student behavior. The findings indicate the importance of student teachers debriefing with the mentor by discussing the effectiveness of the instruction and implications for student learning. In the course of these conversations, student teachers were supported to examine problems of practice and had opportunities to develop more sophisticated ways of talking about students’ disciplinary ideas and the types of instruction that might support their learning. Further research is needed to investigate the influence of co-teaching with an accomplished mentor on novice teachers’ practices when they teach on their own without ongoing support. In addition, studies are needed that investigate the value of co-teaching with a more accomplished other in in-service rather than pre-service settings. Future studies should also clarify the aspects of practice most open to refinement during co-teaching, the occasions during co-teaching when it is productive for coach and teacher to confer about aspects of practice, and types of questions and feedback that are useful to teachers during subsequent debriefing discussions.

Modeling

While co-teaching is a potentially important means of support, there is evidence that observing a more accomplished colleague enact particular practices can also be productive. Modeling typically involves an accomplished teacher intentionally displaying certain teaching practices with the aim of promoting student teachers’ professional learning (Tharp & Gallimore, 1988). There is evidence that modeling can support teachers in developing an image of accomplished enactment of those practices (Feiman-Nemser, 2001; West & Staub, 2003), and might therefore be appropriate as a starting point for teachers beginning to consider how to enact a particular instructional practice.

Several studies have examined how teacher educators model “new visions learning” to pre-service teachers (e.g., Bronkhorst, Meijer, Koster, & Vermunt, 2011; Loughran & Berry, 2005; Lundenberg, Korthagen, & Swennen, 2007). Feiman-Nemser (2001) examined how an accomplished teacher’s mentoring practices, which included modeling, supported eight beginning elementary teachers in a two-year induction program. Feiman-Nemser conducted interviews with the beginning teachers and the mentor teacher, and observed beginning teachers’ practices in order to understand the mentor’s practices. The mentor described modeling as a way to give a “living example” of teaching. Through his modeling, he hoped that the novices would begin to identify characteristics of good teaching. To accomplish this, he often paused during the lesson to highlight key aspects of his practice and to explain to beginning teachers what he was doing and why. After the lesson, the mentor asked the beginning teachers to interpret what they saw. Unfortunately, Feiman-Nemser did not investigate what the beginning teachers learned from observing the mentor teacher.
There is some indication that modeling might be a useful starting point provided facilitators support teachers in reflecting on the model lesson during debriefing conversations. However, research on professional learning (Grossman et al., 2009a) suggests that the activity of modeling is unlikely, by itself, to support teachers’ development of the focal instructional practices. More research is needed to clarify further what teachers can learn from observing a more accomplished other. Furthermore, studies are needed that investigate what facilitators can do to support teachers’ noticing of specific teaching practices and what tools can support those noticings.

Observing and Debriefing Challenges of Implementation

Learning theorists who take a sociocultural perspective typically describe learning as a process of moving from assisted performance to unassisted performance (Brown et al., 1996; Lave & Wenger, 1991; Tharp & Gallimore, 1988). Literature on professional development and teacher education emphasizes the importance of teachers receiving support and feedback on their instructional practices from a more knowledgeable other (Garet et al., 2001; Putnam & Borko, 2000).

Researchers who study teacher education often indicate that post-observation dialogues should focus on aspects of practice that impact student learning, and should involve generating solutions to problems of practice (Roth & Tobin, 2001; Scantlebury, et al., 2008). However, the details of this process are typically left vague. We were able to locate only one teacher education study that analyzed the extent to which feedback supported the development of high-quality instructional practices. In this study, Borko and Mayfield (1995) examined the content and characteristics of teaching conferences between four middle-school mathematics student teachers and either their university supervisors or mentor teachers. They found that these conferences were generally brief and superficial, and did not focus on either the nature of mathematics or on strategies for teaching particular mathematical ideas. As a consequence, the feedback the student teachers received did not support them in deepening their understanding of specific lesson components or in thinking about teaching and learning in new ways.

There is broad agreement in the literature on the value of observation and debriefing. Facilitators and teachers can ground debriefing conversation in a specific lesson conducted in this classroom with these students (Tobin & Roth, 2006), and can discuss both how the lesson could be improved and what should take place in subsequent lessons. However, Borko and Mayfield’s findings point to the difficulty of engaging in rich and deep conversations that have potential to deepen teachers’ knowledge and practices. Several researchers have proposed hypotheses about the types of feedback that support reflection and improvements in practice (Kilbourn, 1990; Watkins, 2000). These suggestions include beginning with commentary of what took place during the lesson, being non-judgment, and encouraging the teacher to identify issues for discussion. However, the type of feedback that is useful for teacher development is largely understudied. More research is therefore needed that focuses explicitly on the relation between types of feedback and changes in instructional practice in order to identify potentially productive types of feedback that are tailored to teachers’ current practices.

Discussion

In this article, we have identified four potentially productive activities in which coaches might engage groups of teachers and three in which they might engage individual teachers in their classrooms. For each activity, we identified both what we know by synthesizing current
research findings and indicated current gaps in the research base. A significant number of studies have investigated teachers’ learning as they engaged in group activities, but research on activities conducted one-on-one with teachers in their classrooms is quite thin. Although we have focused on mathematics teaching for the most part, we contend our findings are relevant to coaching in other content areas and indeed to teacher education more generally.

A few of the studies we reviewed that focused on groups of teachers examined changes in the participating teachers’ beliefs and knowledge, and in the nature of their participation. However, these studies rarely investigated whether and to what extent participation in group activities supported teachers’ reorganization of their instructional practices. As Borko (2004) notes, investigating links between professional development designs, teachers’ learning during professional development activities, and any resultant changes in their classroom practices is challenging. However, several researchers have proposed frameworks for investigating these links that make explicit use of data on both student and teacher learning (Desimone, 2009; Fishman, Marks, Best, & Tal, 2003; Loucks-Horsley & Matsumoto, 1999; Penuel, Fishman, Yamaguchi, & Gallagher, 2007). Studies conducting using such frameworks have the potential to address the gaps we have identified in the current research literature, including what coaches need to know and be able to do in order to enact the seven types of activities effectively.

In addition to investigating the seven potentially productive coaching activities, future research should also investigate how the different types of activities can be sequenced to create coherent sets of supports that take account of teachers’ current instructional practices. Addressing this issue requires the development of empirically-grounded trajectories for teachers’ learning that differentiate between, for example, the needs of novice teacher and more experienced teachers.

As a final observation, the analytic approach we have used is relevant to researchers who seek to investigate the design and enactment of coaching activities, and indeed of professional development activities more generally. As we have illustrated, this analytic approach focuses on the content of coaches’ work with teachers as they enact particular types of activities and assesses the learning opportunities that arise for teachers as they engage in those activities. The resulting findings are relevant to school and district leaders, and can guide decisions about how coaches might focus their efforts to support instructional improvement, thereby enabling leaders to better define coaches’ roles. The effective enactment of the types activities we have discussed also serves to delineate goals for coaches’ learning. Our findings can therefore orient the work of district mathematics specialists and others charged with supporting coaches in working more productively with teachers.
Aim: Identify Characteristics of High-Quality Professional Development
Method: Synthesized seminal reviews of the professional development literature

Result: Six characteristics of high-quality professional development

Aim: Identify activities in which coaches might engage either individual teachers or groups of teachers
Method: Reviewed professional development, professional learning, teacher education, and coaching literatures

Result: 19 coaching activities

Aim: Identify coaching activities that are potentially productive
Method: Map the coaching activities against the characteristics of high-quality professional development characteristics)

Result: Identification of nine potentially productive coaching activities

Aim: For each potentially productive coaching activity, determine whether there is evidence that it supported teachers’ learning
Method: Review literature specific to each of the nine coaching activities

Result: Identification of seven potentially productive coaching activities for which there is evidence of teacher learning

Figure 1. Sources of Literature
References

Author, 2009
Author, 2013


Clark, K., & Borko, H. (2004). Establishing a professional learning community among middle school mathematics teachers. In M. J. Hohnes and A. Fuglestad (Eds.), *Proceedings of the*


Appendix A
## Potential Coaching Activities

Possible Activities with Groups of Teachers

<table>
<thead>
<tr>
<th>Activity</th>
<th>Intensive and Ongoing</th>
<th>Integrated into Problems of Practice</th>
<th>Pedagogies of Investigation or Enactment</th>
<th>Cultivates Common Language</th>
<th>Fosters Teacher Communities</th>
<th>Includes Individual Follow-up Support</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Analyzing classroom video</strong></td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td><em>Sharing and discussing excerpts of classroom videos</em></td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>(Loucks-Horsley &amp; Matsumoto, 1999)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Analyzing test data</strong></td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Analyzing test data, typically to identify which students need remediation or what teachers should reteach</em></td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Darling-Hammond, et al., 2009)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*<em>Facilitating book study</em></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td><em>Examining narratives and case discussions</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Loucks-Horsley &amp; Matsumoto, 1999)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Conducting classroom visitation</strong></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td><em>Visiting and observing other teachers’ classrooms</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Darling-Hammond, et al., 2009)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Co-designing instruction</strong>*</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td><em>Working with other teachers to identify instructional tasks and develop assessments</em> (Darling-Hammond, et al., 2009)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Compiling teacher portfolios</strong></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Collecting of artifacts and reflections that document a teacher’s professional practice</em> (Wilson &amp; Berne, 1999)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Conducting action research with others</strong></td>
<td>x</td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td><em>Conducting research on questions of their choosing about students’ learning</em> (Loucks-Horsley &amp; Matsumoto, 1999)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Engaging in mathematics</strong></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td><em>Engaging in disciplinary content with other teachers</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Loucks-Horsley &amp; Matsumoto, 1999)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Examining student work</strong></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td><em>Examining students’ responses to mathematical tasks</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Loucks-Horsley &amp; Matsumoto, 1999)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Journaling about experiences</strong></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Recording observations and reflections</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Wilson &amp; Berne, 1999)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Engaging in lesson study</strong></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td><em>Collaboratively planning, teaching, observing and critiquing a small number of lessons</em> (Darling-Hammond, et al., 2009)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mapping the standards to the curriculum</strong></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Examining standards to identify which mathematics to teach</em> (Loucks-Horsley &amp; Matsumoto, 1999)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Leading one-time workshops</strong></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Leading workshops aimed at implementing new curriculum materials or teaching strategies</em> (Loucks-Horsley &amp; Matsumoto, 1999)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Rehearsing aspects of instructional practice</strong></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td><em>Trying out new instructional practices, without students</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>(Loucks-Horsley &amp; Matsumoto, 1999)</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Possible Activities with Individual Teachers

<table>
<thead>
<tr>
<th>Activities</th>
<th>Intensive and Ongoing</th>
<th>Integrated into Problems of Practice</th>
<th>Pedagogies of Investigation and Enactment</th>
<th>Cultivates Common Language</th>
<th>Fosters Teacher Communities</th>
<th>Includes Follow-up Support</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Coaching cycle</strong>&lt;br&gt;Engaging teachers in a preobservation discussion, observation, and postobservation discussion (Bean et al., 2010)</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td><strong>Co-teaching</strong>&lt;br&gt;Working collaboratively with coaches to co-construct and co-teach lessons together (Poglinco et al., 2003)</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td><strong>Debriefing challenges of implementation</strong>&lt;br&gt;Being observed by experts in order to receive critical feedback (Poglinco et al., 2003; Putnam &amp; Borko, 2001)</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td><strong>Observing instruction (Modeling)</strong>&lt;br&gt;Observing coach and engaging in discussions about goals, tasks, teaching strategies, and student learning (Poglinco et al., 2003; Putnam &amp; Borko, 2001)</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

*Denotes those activities that meet 5 of the 6 characteristics of effective professional development; however, the literature describing what teachers had opportunities to learn from engaging in these activities was insufficient to include in final analysis.