

**THE ROLE OF A  
MATHEMATICS  
CONTENT- FOCUSED  
COACHING PROJECT IN  
PREPARING  
MATHEMATICS  
SPECIALIST CANDIDATES  
TO COACH**

Toni P. Sorrell  
*Longwood University*  
sorrelltp@longwood.edu

Jamey Lovin  
*Virginia Commonwealth University*  
lovinjl@vcu.edu

**ABSTRACT**

The purpose of this paper is to reflect upon the mathematics content-focused coaching (MCFC) process from the perspective of coaches in their work with teachers, specifically, the effective strategies and techniques used by the mathematics coaches as they work with teachers and focus on mathematics and student learning. We discuss the MCFC project, assigned in many mathematics specialist preparation program leadership classes, in detail. Then we discuss the reflection the participants submitted in a course in which this project was assigned at two different universities and the ways in which these submissions can be used as a reflective activity and tool that coaches can employ to support learning. Implications for future research will also be discussed.

**KEYWORDS**

mathematics coaching, reflective practitioner, video, teacher training, mathematics specialist

Candidates from Virginia universities with mathematics specialist preparation programs complete a Mathematics Content-Focused Coaching (MCFC) video project as part of their leadership coursework. This project can be one of the most powerful experiences participants go through during their teacher leadership preparation, as it provides them with an opportunity to coach a teacher through all phases of a mathematics lesson, one of the critical roles they will undertake as school-based mathematics specialists. We will review the literature, provide an in-depth look at the project, reflect on its strengths, and consider future directions for our research.

## Literature Review

### Coaching

The term “coach” conjures up many different images: coaches for sporting teams, voice coaches to prepare for choral performances, and even life coaches to help navigate the obstacles of everyday living. When applied to teaching and learning, the term has been defined in many different ways but most broadly as “a person who works collaboratively with a teacher to improve the teacher’s practice and content knowledge” (Yopp et al., 2011 p. 50).

Likewise, there are a variety of different models and texts that describe the practice of coaching. Yopp et al. (2017) suggest there are four commonly used approaches: cognitive coaching (Costa & Garmston, 2002), content-focused coaching (West & Staub, 2003), instructional coaching (Knight, 2007), and mathematics coaching (Hull et al., 2009). Yopp et al. (2017) articulate commonalities and differences in the models. All four of these coaching models address the collaboration between the coach and teacher, but the point of emphasis and approaches differ. In cognitive coaching (Costa & Garmston, 2002) the coach helps the teacher negotiate the reflection on and refinement of their practice. The instructional coaching model (Knight, 2007) is that of an on-site professional developer who attends to the skills required of successful coaches. Mathematics coaching (Hull et al., 2009) blends the importance of implementing effective instructional strategies and deep knowledge of mathematical content.

We have chosen to focus on Mathematics Content-Focused Coaching (MCFC) (West & Staub, 2003), as it is the model used by many mathematics specialist preparation programs in the Commonwealth of Virginia. In content-focused coaching, the coach has developed a deep understanding of mathematical pedagogical content knowledge and supports teachers’ instructional practices (Gibbons & Cobb, 2016).

In the MCFC model, two types of coaching “moves” are involved in pre- and post-conferences: (a) those that invite teacher contributions, and (b) those that provide the teacher with direct assistance in designing mathematics lessons (West & Staub, 2003). Moves that invite teacher contributions are “statements or questions by the coach that initiate and invite the teacher to verbalize perceptions, thoughts, plans, deliberations, and arguments” (West & Staub, 2003, p. 15). Moves that provide direct guidance are “statements by the coach that provide guidance and explanations for specific designs and ways of implementing a lesson” (West & Staub, 2003, p.15). Indeed, West and Staub (2003) suggest that the goal of a coach, as they gain more experience, is to employ more invitational moves in coaching conversations.

Most MCFC conferences also involve conversations about mathematics content, pedagogical content knowledge, and other topics (e.g., classroom behavior and time management). It has been suggested that the most successful coaching conversations occur when

the focus of the conference is maintained on students and their work, not on the teacher (West & Cameron, 2013).

## Videos

Videos of teaching have been used prominently in pre-service and in-service learning opportunities (Barlow, 2014; Schoenfield, 2017). Videos capture nuances not found in printed transcripts and reduce ambiguity in trying to denote what is in the mind of the teacher (Hiebert et al., 2002). West and Staub (2003) and West and Cameron (2013) provide videos of the MCFC process featuring expert coaches.

## Reflection as a Professional Development Tool

Reflection enables us to make meaning of our experiences. When applied to learning, it is a “reflexive activity which enables the learner to draw upon previous experience to understand and evaluate the present, so as to shape future action and formulate new knowledge” (Abbot & Ryan, 2001, p. 58). In coaching, reflection is a necessary activity for change but must occur before any action is initiated (Askew & Carnell, 2011). It is important for coaches to use reflective discussions with teachers to bring about change, remembering that these conversations must be had in a caring and sensitive way (Askew & Carnell, 2011).

West and Staub (2003) consider reflection an important component of the coaching process that enables teachers to improve students’ content-specific learning. West and Staub (2003) discuss how a coach facilitates productive and purposeful conversations centered on supporting students’ mathematical learning and teachers’ professional expertise. The coach pivots conversations around *what* content the students will learn, *how* the teacher will address these content ideas during the lesson, and *why* the teacher plans to teach content in a particular way (West & Staub, 2003; West & Cameron, 2013). For West and Staub (2003), the *why*, is particularly important. By asking questions about why the teacher plans to structure lessons in a specific manner, the coach encourages teachers to be reflective about their practice.

In his seminal work on reflective practice, Schon writes:

A coach’s legitimacy does not depend on his scholarly attainments or proficiency as a lecturer but on the artistry of his coaching practice. The question is not how much you know, but rather how effectively you can help others to learn. . . . I believe the most effective organizations of the future will be led by coaches committed to helping others learn (1987, as cited in Askew & Carnell, 2011, p. 1).

## Description of the Project

### Overview

Since the publication of *Content-Focused Coaching: Transforming Mathematics Lessons* (West & Staub, 2003), educators across the United States and Canada have acknowledged that content coaching is a powerful and effective approach to improving teacher practice in service of student learning (Gibbons & Cobb, 2016). MCFC is a very specific process that focuses on the core planning of instruction, teaching, reflecting on, and refining lessons. MCFC uses a three-part cycle: plan, teach, and debrief. Candidates in the Virginia Commonwealth University and

Longwood University mathematics specialist leadership courses video record themselves conducting a pre-conference and post-conference with a teacher in their school. Candidates also view videos that feature experienced coaches working with a variety of teachers (e.g., reluctant teachers, beginning or experienced teachers). Currently, the videos viewed by candidates at these two institutions were created by West and Staub (2003) or West and Cameron (2013).

### **MCFC Project Assignment Details**

Candidates identified a classroom teacher to plan and facilitate one MCFC cycle. The MCFC cycle included: (1) preparing for the pre-conference, (2) facilitating the pre-conference, (3) observing and possibly co-teaching the mathematics lesson, (4) preparing for the post-conference, and (5) facilitating the post-conference. While engaging in the MCFC cycle, candidates maintained notes from the classroom observation of the lesson and from both pre- and post-conferences. After engaging in the MCFC cycle, candidates shared a video segment from the pre- and post-conference and their personal written reflection on the experience with their peers.

## **The Role of the Coach**

### **Before the Pre-Conference**

One of the most important considerations is the selection of the teacher a coach is going to work with, whether the teacher volunteers or is invited by the coach. Equally important are the topics covered in pre- and post-conferences that may vary for a number of reasons (e.g., the experience levels of the coach and teacher, school and district initiatives, personal and professional goals). Before the pre-conference, the coach should approach the teacher for a copy of the lesson plan or lesson topic. The coach explores the mathematics involved in the lesson and investigates possible pedagogical delivery vehicles. Engaging in these activities helps the coach develop a set of written questions to guide the pre-conference and create ways to further develop the teacher's mathematical pedagogical knowledge.

West and Cameron (2013) suggest coaches consider questions like time allocated for the meeting, prioritization of goals for the planning session, teaching and learning issues that present instructional challenges, and the teaching style or experience level of the teacher being coached. A thorough overview of lesson design with potential coaching conversation questions can be found in West and Cameron (2013). Coaches are encouraged to make a concerted effort to include research-based best practices for mathematics teaching, like the five practices for orchestrating productive mathematics discussions (Smith & Stein, 2018) and the seven effective mathematical teaching practices in *Principles to Actions* (NCTM, 2014).

### **Pre-Conference**

The coach will video record and take notes during the pre-conference using the set of questions developed previously to guide the conversation. The coach may guide the conversation to emphasize the mathematics of the lesson, how the mathematics will be developed, and the mathematical learning outcomes for the students.

## **The Lesson**

The coach will observe the lesson while focusing on not only the teacher's actions but also on student interactions, misconceptions, connections, and strategies. Although in practice, coaches often co-teach a lesson, we encourage our candidates to observe for their first coaching experience, looking for how the mathematics content is being taught as well as any other previously agreed-upon topics.

## **Post-Conference**

The coach will video record and take notes during the post-conference. The coach will come with a set of questions that encourage the teacher to think about the teaching and learning that occurred in the observed lesson. The set of questions is not a script but a collection of ideas that encourage the teacher to think deeply about the lesson. Coaches should be mindful of keeping the conversation grounded in evidence of student learning (e.g., observational notes or student work) while attending to common student misconceptions and struggles.

## **MCFC Project Reflection**

Candidates must reflect on all aspects of the MCFC cycle. The reflections center around four components. First, how the candidate and teacher develop mathematical content and pedagogy during the pre-conference. Second, how the candidate, after watching the lesson, suggests possible refinements that could be made to the lesson. Third, how the candidate examines student work and considers the teacher's plan for next instructional steps. Fourth, how the candidate determines next steps for their own professional growth as a coach. The reflection is both a summary of what happened during the MCFC cycle and a blueprint for next steps in the development of the candidate and the teacher they work with.

## **Reflections from Instructors on the Project**

### **Instructor A**

The coaching project is one of the integral projects in my mathematics teacher leadership class. This is the last leadership class in the mathematics specialist preparation program, and it is essential that the candidates have the opportunity to study and practice the art of MCFC. At this point in the program, candidates are ready to put into practice all they have learned about mathematical content and pedagogy. All of the candidates have to share their pre- and post-conference videos and give a presentation about their coaching experience. When the candidates in a recent cohort shared their videos with their colleagues, they began to see that everyone had some areas in which they could improve and where they had performed well. One thing that surprised my students was that they had many shared experiences, which I summarize next.

Candidates realized it was a privilege to work with other teachers, and they wanted to make sure the teacher knew they valued them as the classroom expert. Further, candidates realized that having a productive conference meant they had to be prepared and focused. Candidates recognized the need to become better listeners while focusing on the mathematics content and pedagogy. Lastly, candidates realized they needed to use more invitational coaching

moves and less direct guidance moves. For example, an invitational coaching move would be one in which the candidate may ask the teacher, “What task were you planning to use to increase students’ understanding of equality?” as opposed to a direct guidance move in which the candidate provides a copy of an activity for the teacher to use in the lesson.

In my opinion, this assignment shifted the candidates’ view of their own identity to include the role of a mathematics specialist. I believe the candidates greatly benefit from this project. I would have preferred that my students have more than one opportunity to complete the MCFC coaching cycle during the semester, but time constraints make this impossible. A video repository would provide candidates with access to coaching videos made by mathematics specialists. Access to the repository would provide candidates with a reference to help prepare them for future coaching and build confidence in their coaching abilities.

## **Instructor B**

I have used the MCFC assignment for many years in my role as an instructor for cohorts of teachers in the mathematics specialist preparation program. I think this is the most valuable activity coaches participate in during their leadership courses because it gives them the opportunity to practice “coaching.” Most of the candidates who participate in our project have similar opinions. In addition to the activity’s value to them as potential coaches, many participants find that it informs their practice.

One participant from a recent cohort remarked, “I had a lot of uncertainty about what coaching looked, sounded, and felt like. After going through one coaching cycle, I have a clearer picture of what coaching is, and how I see myself in this role” (Monique, personal communication).

Other participants liked it because it aligned with the same best practices they find critical for students:

The content coaching cycle is the type of personalized professional development that our education system needs. We often talk about differentiating for students, but differentiation for teachers has never been a priority . . . I don’t think I would have known about any of Ms. C’s content needs if I had, for example, just led a workshop on strategies for teaching measurement. When prepared with good questions and resources, the content coaching cycle allows coaches to diagnose and meet individual teacher needs (Jordan, personal communication).

Still others mentioned the fact that the MCFC cycle allows the coach and teacher the opportunity to be reflective about their practice. “The content coaching cycle is important because it provides a time for the teacher to reflect. Whether you reflect on positive aspects, or areas for improvement, reflection allows for growth” (Cho, personal communication).

With that said, I think there are two challenges with the assignment. First, there are no video exemplars, reflections or interviews except for a few that have been done by professional coaches. Most students in the program find these polished examples intimidating as they often feel they do not realistically portray work performed by emerging coaches. Creating an online video repository will make this issue less problematic. The second concern is that after viewing pre- and post-conference videos with prospective coaches, they often ask me, “So, how did I do?” They want targeted feedback about the effectiveness of their conferences. I find my responses to this question very subjective. I can point to what research says should be the goal of conferences, but I know that having an evaluation protocol to help frame the conversation would

improve my ability to give productive feedback. I think it would be helpful for me to know how coaches rate the effectiveness of their coaching sessions and what attributes of the sessions contributed to the overall effectiveness of the conference.

### Conclusions

After studying the videos and reflections provided by participants while completing the MCFC project, we feel it is the most impactful of all projects completed in mathematics teacher leadership courses. It gives the participants an opportunity to coach and use many of the skills they have learned in their program up to this point. For many it is the first opportunity to do so. Creating their video and reflecting on the experience through the assignment prompts allows them to understand the role they will be expected to play as a mathematics coach. They learn how to offer their teachers personalized support that can have a positive impact on the work they do in the classroom. We also acknowledge that there are ways to improve the tools that support the project. First, we found that candidates and teacher teams who found their coaching conversations to be effective spent the most time employing invitational moves focused on mathematics topics. Indeed, West and Staub (2003) suggest that the goal of a coach, as they gain more experience, is to employ more invitational moves in coaching conversations. Likewise, they suggest the most successful coaching conversations occur when the focus is maintained on students' mathematical thinking and their work. Second, candidates would benefit from a video repository so that they could have examples of coaches at various experience levels as they employ best practices in their work (e.g., working with reluctant teachers, novice teachers, coaching tasks, and coaching small instruction).

**Table 1**  
*Video Analysis Template*

| Coaching Moves                 | Topic                           |          |       |
|--------------------------------|---------------------------------|----------|-------|
|                                | Mathematics Content<br>Pedagogy | Pedagogy | Other |
| Direct Guidance                |                                 |          |       |
| Invitation-Guidance<br>(Mixed) |                                 |          |       |
| Invitation                     |                                 |          |       |

*Note.* Numbers recorded in table should represent the percent of time coaches and teachers spent discussing conference topics and coaching moves used by the coach in guiding the discussions. Total of all time should be 100 percent. Once this protocol is formalized and evaluated, we hope it will be useful in providing constructive feedback for participants.

### Future Research

One of our next steps is to refine and pilot a video analysis protocol developed to analyze pre- and post-conference videos. This video analysis template was created using information about coaching conversations found in the two MCFC texts (West & Staub, 2003; West & Cameron, 2013). These texts suggest there are two important aspects of a coaching conference, what we call “coaching moves” and “conference focus topics.” We arranged the coaching moves

vertically in Table 1. The three categories of topics were placed horizontally in Table 1: (1) mathematics, (2) pedagogy, and (3) other. The Video Analysis Protocol template (Table 1) is the result.

An ancillary benefit of the study we have planned is that we will be creating a collection of MCFC project pre- and post-conference videos. These videos could be the genesis of an online video repository that would feature videos and reflections of pre- and post-conference coaching videos. We have initiated a partnership with the Virginia Council of Mathematics Specialists (VACMS) to host the planned video repository on their website. Videos will be available to mathematics specialists and mathematics teacher leaders in Virginia as a professional development tool.

### Acknowledgment

This paper was developed in part through the project *The Virginia Mathematics Specialist Initiative: An Online Program to Prepare K–8 Mathematics Teacher Leaders for High-Needs School Districts* with support from the National Science Foundation, Noyce Track 3 Award 1660774. The opinions expressed here are those solely of the authors and do not reflect the opinions of the funding agency.

### Author Note

Correspondence concerning this article should be addressed to Jamey Lovin, Department of Mathematics & Applied Mathematics, Virginia Commonwealth University, 1015 Floyd Avenue, Box 842014, Richmond, Virginia 23284. Email: [lovinjl@vcu.edu](mailto:lovinjl@vcu.edu)

### References

- Abbott, J. & Ryan, T. (2001). *The unfinished revolution: Learning, human behavior, community, and political paradox*. Alexandria, VA: ASCD.
- Askew, S. & Carnell, E. (2011). *Transformative coaching: A learning theory for practice*. London: Institute of Education.
- Barlow, A.T., Burroughs, E.A., Harman, S.E., Sutton, J.T. Yopp, D.A. (2014). Assessing views of coaching via a video-based tool. *ZDM Mathematics Education*, 46, 227 – 238. <https://doi.org/10.1007/s11858-013-0558-7>
- Costa, A. L., & Garmston, R. J. (2002). *Cognitive coaching: A foundation for renaissance schools*. Norwood, MA: Christopher-Gordon.
- Gibbons, L.K. & Cobb, P. (2016). Content-Focused Coaching: Five key practices. *The Elementary School Journal*, 117(2), 237 – 260. <https://doi.org/10.1086/688906>
- Hiebert, J., Gallimore, R., & Stigler, J. W. (2002). A knowledge base for the teaching profession: What would it look like and how can we get one? *Educational Researcher*, 31(5), 3 – 15.
- Hull, T. H., Balka, D., & Miles, R. H. (2009). *A guide to mathematics coaching: Processes for increasing student achievement*. Thousand Oaks, CA: Corwin.
- Knight, J. (2009). *Instructional coaching: A partnership approach to improving instruction*. Moorabbin, Vic.: Hawker Brownlow.
- National Council of Teachers of Mathematics. (2014). *Principles to actions: Ensuring mathematical success for all*. Reston, VA: Author.



- Schoenfield, K. (2017). Uses of video in understanding and improving mathematical thinking and teaching. *Journal of Mathematical Teacher Education*, 20, 415 – 432.
- Smith, M. S., & Stein, M. K. (2018). *5 practices for orchestrating productive mathematics discussions* (2<sup>nd</sup> ed.). Reston, VA: National Council of Teachers of Mathematics.
- West, L. & Cameron, A. (2013). *Agents of change: How content coaching transforms teaching and learning*. Portsmouth, NH: Heinemann.
- West, L., & Staub, F. (2003). *Content-focused coaching: Transforming mathematics lessons*. Portsmouth, NH: Heinemann.
- Yopp, D., Burroughs, E.A., Luebeck, J., Heidema, C., Mitchell, A., Sutton, J. (2011). How to be a wise consumer of coaching: Strategies teachers can use to maximize coaching benefits. *Journal of Staff Development*, 32(1), 50 – 53.
- Yopp, D., Burroughs, E.A., Sutton, J. (2017) Variations in coaching knowledge and practice that explain elementary and middle school mathematics teacher change. *Journal of Mathematics Teacher Education*, 22, 5 – 36.