

1

Defining Mathematics Coaching

Does coaching work? Can mathematics coaches make a difference? These are real questions in an ongoing debate about the value of content coaching. According to the National Mathematics Advisory Panel (2008), research that supports coaching is sparse and inconclusive, but so is research refuting it. We believe that the key question should not be whether coaching works but under what conditions. The answer to this question is supported by several beliefs:

- Professionals in many fields rely on coaches to help them perfect their skills (Knight, 2007; West & Staub, 2003).
- Teacher isolation is a deterrent to improving professional skills (Short & Greer, 2002; Williams, 1996).
- Professional development that is specifically related to classroom instruction and student learning is effective (Loucks-Horsley, Love, Stiles, Mundry, & Hewson, 2003; York-Barr, Sommers, Ghere, & Montie, 2001).
- Opportunities to learn appropriate content and curriculum alignment help teachers close the achievement gap (Adelman, 2006; Conzemius & O'Neill, 2001; English, 2000; Marzano, 2003).
- Students can achieve when they have access to high-quality teaching and effective programs (Loucks-Horsley et al., 2003; National Council of Teachers of Mathematics, 2000; National Research Council, 2004b).
- Student learning is increased when high-quality programs are adopted, implemented, supported, and sustained (National Research Council, 2004b).

All of these beliefs point the way to what coaches can do to help teachers teach most effectively.

WHAT IS A MATHEMATICS COACH?

The term *coach* is part of our everyday vocabulary, but what do educators mean when they use it? Most people think of sports coaches first and then realize that there are many kinds of coaches. Music coaches train individuals to play various musical instruments. Voice coaches work with singers, public speakers, and vocal performers. Acting coaches work with actors.

In schools, just as sports coaches work with teams and individual athletes, there are other coaches who work with students to improve their academic skills, for example, for the University Interscholastic League competitions that cross many areas of school life, from writing to business to using calculators. The idea of employing coaches to enhance skills is accepted in our society and our schools (West & Staub, 2003).

But this is the critical point: People form mental images of what a coach is, and these images influence their thoughts and actions. To gain a clear understanding of what a mathematics coach is and does, it is helpful to build a definition in stages:

1. Defining *mathematics coach* for purposes of this book.
2. Identifying the responsibilities of mathematics coaches.
3. Identifying characteristics of successful mathematics coaches.
4. Dispelling negative images.

By working through these stages, readers will be able to develop a mental filter so that they can focus on the critical components of successful mathematics coaching.

STAGE 1: DEFINING MATHEMATICS COACH

Simply stated, *a mathematics coach is an individual who is well versed in mathematics content and pedagogy and who works directly with classroom teachers to improve student learning of mathematics.*

This definition describes the knowledge base required for effective mathematics coaching. The coach is

- well versed in mathematics content and
- well versed in pedagogy.

This definition also describes the actual work of effective mathematics coaching. The coach

- engages in direct contact with classroom teachers and
- works to improve student learning.

In a book of essays on coaching, Felux and Snowdy (2006, p. ix) note, “Different titles exist for this position—math coach, math specialist, math support teacher, math resource teacher, and more. And just as there isn’t consistency with my colleagues’ titles, there isn’t much consistency with their responsibilities.”

The term *coach* can be elusive and even emotionally charged. It can refer to various responsibilities. So what is the essential aspect? Marilyn Burns offers a starting point: “With all of the variations and differences, a common goal guides math coaches—to support the mathematics learning of all students by supporting teachers to improve their teaching of mathematics” (Felux & Snowdy, 2006, p. ix).

The keywords are *support* and *improve*. A mathematics coach

- supports mathematics learning,
- supports teachers,
- improves students’ learning, and
- improves teachers’ teaching.

In order to coach teachers successfully, the mathematics coach must be knowledgeable and capable of direct, effective interaction with teachers. Generally coaches are seen as supporting and encouraging. They continually analyze strengths and weaknesses and build on these findings to help teachers improve instruction so that students’ learning improves.

To some this may sound similar to the definition of a *mentor*. Thus, it is important to distinguish between a coach and a mentor. They are different roles. We will not use *mentor* and *coach* interchangeably.

A mentor is an experienced staff person who is assigned to work with a colleague new to the school or the profession. For example, a mentor might assist a new teacher in learning about the school’s policies and procedures. This definition of *mentor* excludes individuals directly assigned to work with classroom teachers in improving the teaching and learning process, whom we define as coaches.

This is an important distinction, because these two roles often are confused or blended by administrators or policy makers. To be effective as mathematics coaches, individuals in this role need to be able to distinguish

what they do from what mentors typically do. The distinction will become clearer as we identify the responsibilities of mathematics coaches.

STAGE 2: IDENTIFYING RESPONSIBILITIES

Mathematics coaches usually are not assigned to teach classes on a daily basis; they work with teachers who are.

To start, coaches view the big picture of mathematics teaching and learning. Then they focus on identifying particular program strengths and weaknesses. Their purpose is to improve the whole by improving individual components of the mathematics program, and they base this work on National Council of Teachers of Mathematics (NCTM) principles. These principles guide but do not provide a road map. Coaches must determine their course of action on their own, often with little support. The job is demanding, and there is no coach to coach them.

Coaches must support—often stimulate—change. Frequently, that is explicitly what they are hired to do. Coaches' responsibilities should be viewed as part of change processes. The first responsibility of improving students' mathematics achievement cannot be accomplished if something is not changed. The age-old expression holds true: If you always do what you have always done, you will always get what you have always gotten.

Mathematics coaches lead change efforts that are manageable, significant, and within the purview of the coaches and that have a positive effect on student learning. Hall and Hord (2001) state, "Change is not only, however, about the implementors—those who will change their practices—but also about those who will facilitate the implementors in doing so" (p. 27). Mathematics coaches are those who "facilitate the implementors."

To this end, the responsibilities of mathematics coaches can be summarized as follows: They

- work with teachers to improve mathematics achievement,
- manage and control curriculum and instructional materials,
- manage and regulate professional development,
- monitor program implementation,
- build the mathematics program by using its strengths and reducing its weaknesses,
- maintain and share best-practice research,
- build collaborative teams and networks, and
- gather, analyze, and interpret data, such as from assessments and benchmark tests, to inform instruction.

These responsibilities are interconnected; each is part of the whole. Even though mathematics coaches may select one of these to concentrate on at a particular time, the power of coaching resides in understanding how these responsibilities interrelate and influence one another.

Just as mathematical knowledge and skills are not effectively taught in isolation, neither can mathematics coaches work on these responsibilities without taking several into consideration. For example, building collaborative teams of teachers is not an end but a beginning. The coaches' jobs are complex and time consuming. Getting one job done can seem like a major accomplishment, but in reality, that job may be only one component that supports an entire spectrum of responsibilities.

Another example might go like this: A mathematics coach intent on raising student achievement necessarily must work on improving curriculum and instruction. This translates into ongoing assessment that leads to pruning ineffective or misaligned parts of the curriculum and replacing them with effective, aligned components. The changed curriculum may require new professional learning, which the coach also must organize and deliver.

STAGE 3: IDENTIFYING CHARACTERISTICS

If mathematics coaches are to perform successfully their various responsibilities, it follows that these individuals need to possess certain characteristics in the form of knowledge and understandings. These characteristics are indicators, not requirements. Individuals naturally differ in the extent of their knowledge, and some characteristics dominate others. Following are basic knowledge components for successful coaches:

Mathematics Content. Coaches should understand the developmental nature of mathematics and the interconnections among concepts. They also need to know and understand the content contained in state and district standards as well as assessment concepts and requirements. They should understand the purposes and rationales undergirding the adoption of instructional materials and their organization and use in teaching.

Pedagogy. Coaches should be familiar with current research on how students learn and understand how to translate research findings into effective instruction, particularly for underachieving students or students with a primary language other than English. They should know what motivates and engages students in learning at various stages of growth and development.

Adult Learning Styles and Strategies. Coaches should understand adult learning and know how to influence adults to cause change in their beliefs and actions. Coaches need to be effective listeners so that they can appropriately use strategies to motivate resistant teachers by building rapport and bringing them into change initiatives.

Group Dynamics and Social Norms. Coaches should know and be able to use consensus-building strategies. Often the successful use of such strategies depends on a coach's ability to clearly communicate in group settings in ways that are respectful and supportive. Coaches need to understand social norms—various ways that people send and receive messages—and to be alert to all methods of communication, such as those described by Kaser and colleagues (2002), including

- body language,
- physical presence,
- ability and willingness to listen,
- accessibility and openness,
- words, and
- behavior. (p. 50)

Coaches should believe in the power of groups, understand synergy (when the whole is greater than the sum of its parts), and strive to build collaborative communities of adult learners.

Data Acquisition, Analysis, Interpretation, and Application. Coaches should understand the power of data. Data are used to chart progress and maintain motivation, to inform instructional practices, and to ensure that students are learning appropriate content. Data must be accurate, relevant, and timely. Thus, effective coaches know how to collect data and then analyze and organize data for interpretation and application.

Confidentiality and Trust-Building. Coaches have spheres of influence. They are charged with improving mathematics teaching and learning, but their responsibilities also overlap with those of others, from teachers to superintendents. They must coordinate their efforts with these individuals and maintain healthy professional relationships, which can be done only if the coaches can be trusted in professional matters.

STAGE 4: DISPELLING NEGATIVE IMAGES

Coach ought to convey a positive connotation, but that is not always the case. If *coach* is seen as negative, it can undermine the best efforts of mathematics coaches.

Peter Senge and his colleagues (2000) propose the idea of mental models, or images, that form the foundations of beliefs and influence actions. They state, “Our behavior and our attitudes are shaped by the images, assumptions, and stories that we carry in our minds of ourselves, other people, institutions, and every aspect of the world” (p. 67). These mental models usually reside below the level of awareness and are rarely tested or examined. This is the issue for mathematics coaches: If a teacher’s mental model of a coach is someone who is demanding or temperamental (or if the teacher harbors any other negative association with coaches), then actions taken by the coach, however positive in intent, will be filtered through this negative image. The result will be resistance to the actions.

Coaches must balance their self-images with the mental model of a coach held by the teachers with whom they work. These images need to match as much as possible. For example, a teacher may not believe that a mathematics coach belongs in his or her classroom, because the coach’s visits could interfere with instruction, disrupt the lesson, disturb the students, and so forth. This teacher might view a coach’s job as managing materials and developing curriculum, perhaps occasionally helping with planning lessons or training. To be effective with this teacher, the coach will need to correct this image, first by identifying the teacher’s mental model and then by working with the teacher to create a more positive understanding of the coach’s role and responsibilities.

CRITICAL POINTS

In summary, the definition of *mathematics coach* is straightforward:

A mathematics coach is an individual who is well versed in mathematics content and pedagogy and who works directly with classroom teachers to improve student learning of mathematics.

This definition is best understood in terms of supporting teachers and improving both students’ and teachers’ learning. Mathematics coaches have a variety of responsibilities, all of which lead to the bottom line: change. Coaches are employed to be change agents. In order to fulfill this role, they should possess certain characteristics, including knowledge of adult learning styles and strategies, group dynamics, and social norms. They need to understand data acquisition, analysis, interpretation, and application. And they should know about confidentiality and trust-building. Finally, to be successful, coaches need to be able to correct negative images about what coaching means and what coaches do.