



Being a Successful Math Coach

Ten Guiding Principles

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Chris Confer is the mathematics instructional coach at an elementary school in Tucson, Arizona. Her school has about 400 students. Nearly all receive free or reduced lunch, and many struggle with the issues that poverty presents. The majority of the students are second-language learners. As part of her twenty-eight-year teaching career, Chris has supported mathematics instruction at the district level for fourteen years, has supported mathematics instruction at this elementary school along with other sites for ten years, and has been a full-time mathematics specialist at this school for three years.

I remember well the day when I hesitantly agreed to become a math coach in my school, fourteen years ago. Supporting teachers and a principal on the journey to creating quality programs where children truly understood mathematics was a goal that seemed daunting to me. I felt unsure of my own abilities to do and teach mathematics, so how could I help others? It was clearly an enormous, complex task and I didn't know where to begin.

It is hard to know where to begin. Our goal as math coaches is not to add a little spice, salt, or pepper to the stew of mathematics instruction, but instead to alter the menu entirely. Instead of having children simply memorize isolated bits of information, children must understand and use tools of mathematics to make sense of their world.

I believe that, in the same way, teachers must have opportunities to make sense of teaching mathematics. If children are to develop these skills, which are important to their lives and to our nation, teachers cannot simply be “trained” merely to follow directions in a text. Teachers must be knowledgeable practitioners, capably using quality instructional techniques to help children from differing backgrounds and experiences become powerful mathematicians.

Over the years I learned a great deal through trial and error, the support and ideas of colleagues, and the many opportunities I had to learn about mathematics and mathematics instruction. The more I learned about how to be an effective math coach, the more I saw children, teachers, and the school community transform. And the more I witnessed this transformation, the more I fell in love with this job. In the spirit of sharing the bounty that has been offered to me, I offer you the ten principles I keep in mind as I work toward being the most effective math coach that I can be.

1. Make Good Relationships with Teachers a Priority

As a math coach I start by building solid relationships with the teachers with whom I will work. While the job of math coach implies that the school is working toward change, it's important to help teachers understand that you value the job they are presently doing in school with their students. I have come to realize that many teachers feel vulnerable when outsiders come into their classrooms, especially one who is there to encourage them to make changes. This relationship can be very fragile at first. And because the context of our lives informs our teaching, I begin by getting to know the teachers and helping them know me. I chat informally with teachers about my family and what's going on at home, and encourage them to do the same.

Specific Suggestions

- ◆ Help teachers in any way that you can. Remember that teachers have an enormous task. They wear many hats—social worker, psychologist, office manager; creator of materials, developer of curriculum. Furthermore, elementary teachers have to know each subject area in depth so they can meet the needs of children with widely varying abilities. Help them set up their classroom before school starts, gather materials for them, and do those little (but appreciated) things, like taking over their classes so they can get to the bathroom.
- ◆ Listen sympathetically to teachers' worries; they are very real. Laugh with teachers at the funny things their children do; this lightens our load. Celebrate with teachers as their children move forward; this reminds them and you why we chose this profession. Being a cheerleader is one of the most important ways that I support teachers.
- ◆ Understand that many teachers feel a lot of pressure from a variety of sources. Since many of these things are beyond teacher control, help them think about things that they *can* control.
- ◆ Talk to each teacher frequently; greet them cheerily in the halls and pop into their rooms to see how they are doing. I always try to remember that teachers are working hard to be the best teachers they can be; they do what makes sense to them according to their experiences.
- ◆ Honor the confidences that teachers share with you. Know that they are doing their best and that you, too, once walked in their shoes.
- ◆ Don't take yourself too seriously. Walls between teachers tumble down when you and they can laugh at your own mistakes.
- ◆ Recognize that as teachers' doors swing open and conversations begin, the school's mathematics program begins to change. Some teachers love and thrive on this change. Others may need your reassurance that they are doing good things for children, and that we're all learning together how to make things even better.

2. Work Alongside Teachers as a Coteacher, Not an Evaluator

In the same way that children learn more when they feel safe and can say what they really think, teachers are more willing to question their instruction and make changes when they feel comfortable with their math coach. This becomes difficult when teachers think they are being evaluated. I see myself as another teacher, and work to make sure that the classroom teachers see me in that same light.

This perception often does not happen naturally. Many schools are organized in hierarchies, and teachers may view administrators as the “top,” teachers as the “bottom,” and resource teachers as somewhere in the middle. I work hard to change this image, so that teachers see me as a colleague, not as an evaluator or someone who has special powers or privileges.

I find it helpful to move discussions away from teachers themselves and toward the learning that we teachers are doing together. I see myself as a researcher into how I can best improve my teaching practices, and I invite other teachers to think with me about instructional issues. One year I focused a lot on asking good questions, another year on developing mathematical language. I read articles, worked hard on incorporating new strategies into my lessons, and engaged teachers in conversations about my own research and what I was discovering. I soon found that these discussions permeated the entire school.

Specific Suggestions

- ◆ Make sure teachers know that you are their advocate, not their evaluator.
- ◆ Keep the same hours as teachers do. Arrive at school before the required time, and leave later than what is required.
- ◆ Do the same day-to-day tasks that other teachers do. Serve on committees, help with registration on the first day of school, and help out in the cafeteria from time to time.
- ◆ Help teachers understand that you are not there to tell people what to do, but instead have many questions about mathematics

and mathematics instruction. When teachers see that you don't know everything, they feel free to begin asking questions about their own instruction. You become a peer—a colearner—rather than someone who already knows the answers.

- ◆ Be a researcher yourself about quality mathematics instruction. Challenge yourself to improve facets of your own teaching, such as how to better support second language learners, or how to create extensions for students who need additional challenges. Invite classroom teachers to research similar aspects in their own classrooms and to share their ideas with you. When you work in other teachers' classrooms, ask them to observe how specific changes impact student learning. For example, I might say to Ms. Tran, "Would you observe Dánica and Alejandro to see whether they understand how area is different from perimeter?" After the lesson, I would have a conversation about what she noticed, and think with her about how the lesson could be refined.

3. Begin by Working with Teachers Who Are Interested, Curious, or Open to Change About a Different Way to Teach Math

You will get the most momentum as quickly as possible by beginning with teachers who are interested in changing how they teach mathematics and who want you to work with them. By spending the majority of your time working in those classrooms and encouraging these teachers to talk to each other, you begin to create a culture of quality mathematics instruction. When teachers see others teaching differently, when they hear other teachers' excitement about their children's learning, they become interested as well. Excitement begets excitement, and change encourages more change.

Schools are systems, and changing one part of the system alters the balance and the status quo, so that the entire system can shift. Like a snowball that hurtles down a hill and gets bigger and goes faster and faster, starting with a few interested people can expand into a network of teachers engaged in professional investigations and professional discussions.

This is contrary to what many people think, and understandably so. Some believe that the teachers with the greatest needs require attention first, and schools do have the responsibility of addressing that problem. But my goal as a math coach is to affect the system, to make profound changes in *all* the staff.

Specific Suggestions

- ◆ Chat informally with teachers to keep informed about what they are doing with their children. This will help you see ways to support and connect with them. Some of the most powerful work I do is during those conversations in the hallways when a teacher asks a quick question, or I share an insight or ask a question of my own.
- ◆ Invite teachers to investigate some part of mathematics that interests them or that they see as important. For example, I might say to Mrs. López, “I see that you’re working on geometry these days. I just found a copy of *The Tangram Magician*. Would you like me to bring it to your classroom and we can use it to introduce a tangram activity to your children?”
- ◆ Share your excitement about what you see the children doing in other teachers’ classrooms. Invite teachers to become involved in the same investigation so that they become a community of learners.
- ◆ Help all teachers but, in the beginning at least, help them in different ways based on their individual needs. Check in with all teachers once a week to see what they need, so that all teachers know that you are available and accessible. This also keeps you up-to-date about issues that teachers are confronting.
- ◆ While you may plan or problem solve or find materials for all teachers, reserve a consistent block of quality time for those interested in your in-class help. Work with teachers who want you there.
- ◆ When you encounter resistant people, continue to be respectful, friendly, and open. Few of us learned mathematics this way, or have models for this kind of instruction. Teachers learn at different rates

just as children do. And I often find I can learn from people who disagree with me; they may have a point that I need to consider.

4. Recognize That Change in Instruction Happens Primarily When Support Relates to Teachers' Specific Classroom Instructional Needs

The work I do with teachers in the classroom is the basis of how I support change in our school's mathematics programs. I rarely do demonstration lessons because teachers are more interested and engaged when we teach together. As we teach together, we encounter the real complexities of teaching, and we think through some of the hundreds of decisions that teachers have to make instantly.

Before I meet with a teacher to plan a lesson, I consider instructional techniques that will be helpful for this lesson. I know that teachers' planning time is precious, so I try to have the groundwork prepared ahead of time.

When we plan the lesson together, we begin by identifying its focus. Then we decide how we will introduce the investigation, identify how to support children during the investigation, and plan how to process, or discuss, the investigation with the children. We also identify some of the difficult vocabulary the children are likely to encounter. Then we talk about which of us will do which part of the teaching.

I usually prefer to have the teacher begin the lesson by introducing me, if necessary, and letting the children know what the focus of the lesson is, perhaps connecting it to what the children have already done with that topic. I prefer to introduce the actual investigation to the children, since I usually have had more time to think through the lesson. Once I have completed the introduction, and the teacher can see the direction of my teaching, I often ask the teacher to continue the line of questioning or the discussion.

I love the synergy that is created when the teacher and I encounter a confused student or a difficulty in a lesson, and we find that we need each other to figure out the best approach. The teacher has a lot to contribute, based on his or her understanding of teaching and the students. My own contributions stem from my focus on mathematics and

teaching practices. Together we find that we are a strong team—and both of us learn!

The learning that I am constantly doing in classrooms keeps me honest in my work with teachers. I remember that there is no one “best way,” no magic solution to teaching mathematics. I make sure that each year I know at least one classroom of children very well. This allows me to look at learning over the course of the year, and to help teachers deal with the hard issues such as weaving together a strong curriculum, meeting the needs of children with different levels of experiences, and assessing student learning.

Specific Suggestions

- ◆ Always plan with teachers before working in their classrooms. Use your school’s lesson plan format but plan in additional detail. Specifically plan each part of the lesson, such as how you will introduce the lesson, how you will support students who need additional help, and how you will have the students discuss what they discovered. Clarify the roles that each of you will take during each part of the lesson. For example, Mrs. Nelson and I might plan to introduce the lesson together, or I might introduce the lesson while Mrs. Nelson observes how the students respond to my introduction.
- ◆ Talk with the teacher ahead of time about who will do what during the lesson. Begin the teaching so that the teacher gets a better sense of how you’re approaching the lesson. Then “hand off” the lesson to the teacher. Be sure that the teacher and you feel comfortable jumping in to help each other when necessary.
- ◆ Chat with the teacher as the children work. Share what you notice, listen to the teacher’s perceptions, and value them. Talk together about how you can support children who need help, and how you can offer certain children additional challenges. Discuss changes that you need to make as the lesson progresses.
- ◆ Share your excitement about children’s thinking and strategies with their teacher. Help the teacher to see the children through new ideas and marvel at the different ways children think.

- ◆ Work alongside the teacher to improve instruction as you teach. Help each other to find the best questions that clarify children's thinking and misperceptions, and move them to new understandings.
- ◆ Know that your lessons are not perfect and never will be. In fact, teachers need to see that you make mistakes too! Laugh at your mistakes and learn from them—together.
- ◆ Respect teachers' different ways of organizing classrooms and the special relationship that they have built with their children. Remember that at first you are a guest and over time you will become part of this community of learners.
- ◆ Touch base with the teacher later in the day, to chat about what went well, or to have an in-depth conference. Talk about what you noticed in the children, effective questions, changes you'd make if you were to do the lesson again, and where the class might need to go next. If you have time, edit the lesson plan with these changes.

5. Provide Teachers with Ongoing Chances to Meet with Other Teachers to Be Learners of Mathematics and to Reflect on Their Instruction

I am convinced that the more mathematics I know, the more I understand how the concepts and models build a strong mathematical framework for students. The more mathematics I know, the better I see how the continuum of curriculum builds from the children's earliest mathematical understandings to more complex concepts. The better I understand this continuum, the more I can meet the needs of different students, and help them make connections between concepts so they truly make sense of mathematics.

When teachers do not understand mathematics, they tend to fall into the misunderstanding that their task is simply to cover objectives that will be tested. They believe that objectives have relatively equal importance, and that teaching happens best through simply telling

the children procedures and having the children practice so they can remember. Instead, this kind of teaching leads children to fragile understandings that crumble under the weight of too many partially memorized, disconnected objectives. That is when children ask, “Do I add? Do I subtract? Just tell me what to do!”

Teachers, like children, learn more when they can talk about what they are learning. Therefore, teachers benefit from chances to discuss their ideas about teaching mathematics. Teachers need chances to attend workshops, preferably with teachers at other schools. At district-wide workshops, teachers become researchers about mathematics curriculum and best practices. They try out the activities that they will do with children and think through instructional and curriculum issues. Teachers can meet again after they have tried the lesson with their students, to share ideas and solve problems together.

But teachers can also benefit from meeting with teachers from their own site. Pairs of teachers can plan the same lesson, and end up in a dynamic discussion about teaching practices. Larger groups or the entire staff can meet to look at how particular concepts are developed throughout the grades, consistency in expectations from grade to grade, or other issues that affect that site alone.

Specific Suggestions

- ◆ Search out opportunities for teachers to learn mathematics. District-level workshops, where teachers can be released of classroom responsibilities for a day so they can learn mathematics and think about mathematics instruction, are best. College classes, study groups, and conferences through professional organizations such as the National Council of Teachers of Mathematics give teachers chances to learn mathematics and about mathematics instruction.

- ◆ Search out or create chances for teachers to come together to discuss teaching issues. These can be workshops for teachers researching mathematics instruction, book study groups, or a pair of teachers discussing student work.

- ◆ Look for in-depth institutes that help teachers make paradigm shifts, such as Math Solutions. These longer workshops move teachers to question what they typically do, and often are the impetus for change.
- ◆ Try to find ways that teachers from your school can meet with teachers from other schools. This frees teachers of their typical patterns of interactions, allowing them to think more broadly.
- ◆ Help teachers learn about what standardized tests do tell us and don't tell us about children. Through a curriculum focused on concepts and problem solving, children can make sense of tests—they're simply another problem to solve.
- ◆ When you find opportunities to learn mathematics, don't just put a note in teachers' boxes—invite them in person. Share your enthusiasm about this opportunity.
- ◆ Have several teachers go together to conferences or workshops, and attend with them. Some of the most effective conversations I've had with teachers took place over lunch during a workshop, or while driving to a conference.
- ◆ Let the teachers know that there are no simple answers, that you are still learning mathematics, that you love math, and that you enjoy teaching it.

6. Encourage Teachers to Share with Others What They Are Learning About Teaching Mathematics

Teachers become excited as they see their children grow mathematically. When teachers share their students' work, or their stories about how they helped the children, they grow professionally. Through articulating their learning to other teachers, to parents, or to their administrator, teachers better understand and recognize the value of

their new instructional strategies. When teachers have an audience, they must think specifically about how they supported the children and how to verbalize the growth that they saw.

Remember that at your school site you are creating a culture of research, where new ideas do not lay stagnant but instead spread throughout the school and then to the wider world. Presenting their discoveries about teaching mathematics validates the learning that the teachers are doing and the spirit of research that you are creating at your school.

Specific Suggestions

- ◆ Look for informal chances for teachers to share what they know. For example, if Mr. Sánchez asks about using geoboards, I might tell him a little but then encourage him to check with Ms. Paul, who has done some great geometry investigations with them.
- ◆ When you give a parent workshop, invite a teacher to help—even in a small way. This allows teachers to try out a new role, and encourages them to do even more the next time.
- ◆ Encourage teachers to present during professional development classes or workshops and conferences. Help the teachers plan what to say or do, and offer to support them by presenting with them, or providing incidental or simply moral support.
- ◆ Don't overlook the many ideas for presentations that abound in day-to-day teaching. Teachers who attend conferences love to see student work and hear stories about how specific students responded to new activities or methods of instruction. Even incidents that may seem small, such as how Clarissa finally was able to use the open number line to solve a problem, provide an enjoyable yet profound focus for a workshop or conference presentation.
- ◆ Encourage teachers to put children's work in the hallway. Other teachers wonder what they did, and great conversations begin.

7. Communicate with Your Administrators

The better your principal understands what good mathematics instruction looks like, the more effective you can be. Help your principal understand that mathematics is the study of relationships, and that these relationships have to be constructed as children learn actively, through using concrete models or manipulatives, by talking about what they know, and by making connections.

This kind of learning is not linear and does not happen in one day. Make sure that the principal understands that complex concepts must develop over time through many experiences. The principal may observe some children's confusion and be concerned, but I explain ahead of time that this is a natural part of the learning process. I tell principals that it is important to take the time to help children make sense, rather than to go forward with a superficial veneer of success that will crumble when expectations increase.

Principals frequently have read about this kind of mathematics instruction, but they may not have had the chance to learn or teach mathematics in this way. So as often as possible, invite the principal into classrooms, so he or she can see examples of quality mathematics instruction. Encourage the principal to participate with a group of children in an investigation. Just as children and teachers learn through seeing and doing, the principal needs many of these same opportunities.

Specific Suggestions

- ◆ Meet with the principal on a regular basis. Make sure your principal knows with whom you are working, and on what topic. Share your celebrations, both about children and about teachers' growth.
- ◆ Give your principal copies of articles that he or she may find helpful. Highlight specific sections that you especially want the principal to read.
- ◆ Recognize that principals are under tremendous pressures. Many find that it's a lonely job. Offer the same supportive, listening ear to

the principal that you offer to teachers. Honor any confidences that a principal shares with you.

- ◆ Invite the principal to watch classroom lessons. For example, when I'm coteaching in a class with children engaged in a mathematical investigation, I might slip out, find the principal, and say, "You *have* to see the incredible strategies that Mrs. Jones's students are using with addition!" When the principal comes in, I clearly explain the value of what the children are doing.
- ◆ Share with your principal your research into quality mathematics instruction and strategies that you and the teachers find successful. Discuss ways to incorporate discussions about these strategies into staff meetings.
- ◆ Discuss the importance of students making sense of mathematics. Share assessments and anecdotes that show student understanding and confusions and discuss the implications they may have. For example, if typical fifth graders say that $\frac{1}{8}$ is larger than $\frac{1}{4}$ because 8 is larger than 4, you may explain to the principal that the fifth-grade teachers plan to take additional time with fractions to help students understand the foundational idea of what fractions mean.
- ◆ Invite the principal to workshops, classes, and conferences. The more mathematics that principals know, and the more they learn about quality mathematics instruction, the better they will be able to support their teachers.

8. Create a Mathematically Rich School Environment

It's important to spend time ensuring that the school environment is full of mathematics. Not only do children learn from their surroundings, but teachers, parents, and visitors do as well.

When I work in classrooms, I try to put some children's work in the hallways to reflect what the children learned. Next to the student

work I place a description of what the investigation was about. I also post a list of the mathematical understandings that the children were developing, in clear and simple language that parents can understand. As well, I like to include a question for children to think about as they walk by. For example, our “Life-Sized Zoo”—life-sized pictures of animals that our math club drew—has questions such as “How many tigers would equal the length of the King Cobra?”

Hallways and school gathering areas, such as the library or cafeteria, are blank slates where math coaches can offer invitations for schoolwide investigations. I currently have a centimeter height chart in the cafeteria next to the place where the children wait in line. I periodically add information about the height of school personnel in centimeters and place new challenges for the children to think about. We occasionally gather schoolwide data, such as where our students were born, and place the information in the foyer so that visitors to our school can better understand our community.

Specific Suggestions

- ◆ Make sure that your hallway display communicates the focus of the lesson and the mathematics that the children were learning. Keep the language clear and free of jargon. For example, “goals” may be easier for visitors to understand than “performance objectives.”
- ◆ Capitalize on the mathematics that can happen through current events and school activities, such as fund-raising, or the number of days until a special occasion. Make hallway displays that highlight the mathematical possibilities. For example, since the student council is currently having a schoolwide food drive, I’m helping a class weigh the donated food and make a display showing how close we are to our goal.
- ◆ Conduct schoolwide surveys or investigations. Place the results in the hallway for everyone to read.
- ◆ Make available a set of mathematical games for children to use after lunch or during recess. Put a basket of counting books or books with patterns in the school entrance where people might sit. Place

a simple puzzle on a table in the hallway where parents might wait with a younger sibling.

- ◆ When teachers attend workshops, put something that was used during the workshop, such as a chart or other display, near the workroom to remind the teachers about what they learned.

9. Remember That Parents Are an Untapped Resource

Parents are the children's first teachers. They taught their children how to talk, how to get along with others, how to share, and innumerable things about how the world functions. They are also the most important mathematics teachers the children will ever have.

Be aware that most classrooms look different from what parents experienced when they went to school. Children are talking, working in groups, using manipulatives, and writing during math class—all things that parents didn't do as children. Parents need to know why we teach in a way that is different from what they experienced when they were children.

When parents have an understanding of the value of mathematics and how mathematics is taught at school, they can better support their children's learning at home. When parents learn why mathematics classes look different, their anxiety disappears and they understand the value of the experiences their children are having at school. And when parents learn what good mathematical instruction looks like, they can be real advocates for their children in this school and in other schools.

Specific Suggestions

- ◆ Provide parents with workshops. Have them try out some mathematical investigations that their children are doing. By actually doing mathematics investigations, parents see the value of this kind of instruction. Explain what concepts children learn and how the concepts fit into the curriculum.

- ◆ Have Math Nights when parents and children can do mathematics activities together. By watching their children in action, parents see the power that children have when they own the mathematics, rather than having to memorize, forget, and memorize again. The more parents understand, the more they can support their children's learning.
- ◆ Be sure to help parents see that there are many ways to solve a problem, and we value children's thinking.
- ◆ Let parents know that it's not helpful to tell the children that they themselves were never good at math. Help parents understand that mathematics is an important door to professional careers, and that every child can be successful at math. Paint a picture of possibility.
- ◆ Put simple and fun mathematics problems in the school newsletter for parents to solve with their children.
- ◆ When teachers begin a new unit in mathematics, help them write a letter home that tells parents what their children will be learning, and things they might do at home to reinforce that learning.
- ◆ Help teachers select homework that reinforces what the children are learning, and that shows parents what is happening at school.

10. Surround Yourself with a Support System

Just as I suspected from the beginning, this is not a job for the faint-hearted! It is a complex one that is demanding not only intellectually, but emotionally and physically as well. A natural part of change is letting go of the old, and it's not easy to support many schools and teachers as they undergo this process.

Our job requires strong listening skills, flexibility, and the ability to understand and appreciate different viewpoints. Although I try to remember that "problems are our friends" and often lead to new ideas

and growth, I often find myself wondering how to approach them. I find that I need my own sounding board, to figure out what to do.

If your district gathers math coaches on a regular basis, you are fortunate. If not, you will need to create the opportunities yourself. It's worth the effort to have a group or friend who can listen to your stories and provide you with a fresh perspective, someone with whom you can laugh or vent, and someone with whom you can think through ideas or share experiences from similar situations.

Specific Suggestions

- ◆ Find a colleague with the same or a similar job. Meet for coffee, and e-mail each other frequently. Although our district reorganized and eliminated our support group, several of us continue meeting regularly on our own after school hours.
- ◆ Read as much as you can. Outstanding educators have written books about nearly any topic that you're interested in: teaching specific strands of mathematics to specific grades; encouraging quality classroom discussions about mathematics; teaching young children mathematics; integrating mathematics with literature or science; and on and on.
- ◆ The National Council of Mathematics and other professional organizations provide access to a larger network through their journals, regional and local meetings, and Web sites. Attend conferences and go to workshops. Take advantage of the support you can get from being part of a nationwide group of professionals on the same path with the same goals.

Finally, know that you are on a journey that will last your entire career. It's absolutely true that the more I know, the more I see that there is to learn. I try to keep in mind that there is no end; we are never "there." It's important, therefore, to periodically look back at how far you—and your school—have come. Just as you would do when hiking up a mountain trail, stop now and then on your professional journey. Relax for a moment. Enjoy the changing view.