

individuals construct their understanding. To the extent that students can develop a greater awareness of thinking processes, they become more independent learners capable of directing and managing their own cognitive actions. But, how likely is it that just making thinking visible through the various strategies discussed in the following chapters will enhance students' awareness of thinking processes and strategies? In our concept map research done at the outset of the Cultures of Thinking Project, we found that on average students at every grade level made statistically significant gains in their reporting of specific thinking strategies on the concept map task, from a 250 percent increase in responses for the younger students to 65 percent for high school students. On average, all students in the sample made gains that exceeded normally developmental projections by more than 68 percent.

One major goal of making thinking visible is to facilitate greater understanding among students. Another aim is to enhance students' engagement and independence. This second goal is accomplished, at least in part, through the development of students' meta-strategic or meta-learning knowledge. As this research shows, the tools presented in this book clearly have an impact on students' learning about learning and their thinking about thinking. The Pictures of Practice woven throughout the book to illustrate the use of strategies provide evidence of the types of understanding that can be elicited through the use of thinking routines and effective questioning. As you work with these ideas yourself, keep these goals in mind and continually look for ways your own students are demonstrating greater understanding, becoming more engaged, and displaying their independence as learners.

Putting Thinking at the Center of the Educational Enterprise

How does one learn to teach? More to the point, how does one learn to teach well? We have to say the more time we spend in education, the more vexing we find this question. Not because there aren't ready answers out there, but because the answers often seem to be too ready, too simplistic, and self-perpetuating in nature. It is easy to think of the job of teaching as delivering the prescribed curriculum to students. Indeed, when we train to be teachers we often focus on the methods of delivering content. There are even courses at the university level referred to as "methods" courses. In our early years of teaching we often struggle with getting the curriculum across and agonize over failed lessons aimed at doing just that. This view of teaching is ubiquitous, generally shared by parents and students as well as teachers themselves. We see it playing out in our language when we talk about teacher "training," which usually means training in new methods. We see it in policymakers' efforts to improve education, which generally focus on changing the curriculum with the assumption that teachers will then deliver that curriculum and schools will improve as a result. We see it in the calls for enhanced content knowledge for teachers, an important thing to be sure, but oftentimes promoted as sufficient for effective teaching in and of itself.

We believe this view of teaching, as little more than the delivery of content, is not only an overly simplistic view of teaching but also a dangerous one in that it puts the focus on the teacher and not the learner, casting the learner in a passive role and assuming that learning is merely taking in what has been delivered. As a result of this view of teaching and learning, assessments focus on the degree of absorption by the student of what the teaching has delivered. Thus, we create a distorted view of teaching that is self-reinforcing and divorced from what we know about supporting effective learning. We judge teaching effectiveness based on student absorption of material, and teaching becomes defined as the delivery of that material. The educational system becomes distorted, being more concerned with producing effective test takers than successful learners (Gallagher, 2010). Consequently, the answer to the question "How does one learn to teach?" becomes, "By mastering the content and developing some delivery strategies." Oh, and you might want

to learn some good classroom management techniques to deal with students' rebellion against their imposed passivity.

In contrast, when we place the learner at the hub of the educational enterprise, our focus as teachers shifts in a most fundamental way that has the potential to profoundly affect the way we define teaching. With the learner at the center of the educational enterprise, rather than at the end, our role as teachers shifts *from the delivery of information to fostering students' engagement with ideas*. Instead of covering the curriculum and judging our success by how much content we get through, we must learn to identify the key ideas and concepts with which we want our students to engage, struggle, question, explore, and ultimately build understanding. Our goal must be to make the big ideas of the curriculum accessible and engaging while honoring their complexity, beauty, and power in the process. When there is something important and worthwhile to think about and a reason to think deeply, our students experience the kind of learning that has a lasting impact and powerful influence not only in the short term but also in the long haul. They not only learn; they learn how to learn.

In Chapter One, we shared how this deeper understanding of the educational enterprise was pivotal in Mark Church's evolution as a teacher. He is not the only one for whom this is true of course. The literature on teacher change suggests that this shift from a focus on teaching to that of learning is a central aspect of many teachers' professional growth and integral to the process of learning to be an effective practitioner (Hatch, 2006; Intrator, 2002, 2006; McDonald, 1992; Palmer, 1998). Rather than seeing learning as the passive taking in of information, we must honor the fact that learning occurs as a result of our thinking and active sense making. Consequently, as teachers interested in both students' learning and understanding, we have two chief goals: (1) creating opportunities for thinking and (2) making students' thinking visible. Although these goals are not the same, they are synergistic and interdependent. When we create opportunities for thinking, we establish both the context and the need for making students' thinking visible.

In his book *Smart Schools*, our colleague David Perkins (1992) makes a case for the importance of developing opportunities for thinking: "Learning is a consequence of thinking. Retention, understanding, and the active use of knowledge can be brought about only by learning experiences in which learners think about and think with what they are learning. . . . Far from thinking coming after knowledge, knowledge comes on the coattails of thinking. As we think about and with the content that we are learning, we truly learn it" (p. 8). Thus, thinking is at the center of the learning enterprise and not a mere add-on, something to do if there is time. We as teachers must acknowledge that

when we reduce the amount of thinking we ask of our students, we reduce the amount of learning as well. However, even when we create opportunities for thinking, we must realize that students' thinking may still be invisible to us. To make sure thinking isn't left to chance and to provide us with the information we need in order to respond to students' learning needs, we must also make their thinking visible.

HOW DOES VISIBILITY SERVE BOTH LEARNING AND TEACHING?

When we make thinking visible, we get not only a window into what students understand but also how they are understanding it. Uncovering students' thinking gives us evidence of students' insights as well as their misconceptions. We need to make thinking visible because it provides us with the information we as teachers need to plan opportunities that will take students' learning to the next level and enable continued engagement with the ideas being explored. It is only when we understand what our students' are thinking, feeling, and attending to that we can use that knowledge to further engage and support them in the process of understanding. Thus, making students' thinking visible becomes an ongoing component of effective teaching.

The Harvard Smithsonian Center for Astrophysics has famously documented how teachers' inattention to students' thinking leads to superficial learning and ingrained misconceptions about science even for students who succeed at the highest level. In their *Minds of Our Own* video, an honors chemistry teacher admits that "I don't like asking 'why' questions on tests. I spend so much time covering the concepts then I ask the question, 'Why?' and I get back so many different answers. It's sometimes very depressing to see some of the answers that you get back when you ask 'Why?' questions. They are valuable, but as a teacher it is sometimes very frustrating to see some of the reasons students think a certain scientific phenomenon takes place." This teacher, far from being cavalier or uncaring, is expressing the bind that he finds himself in when teaching for the test. He knows his students don't really understand what is being taught, but in the delivery paradigm of education he focuses on covering the material for the test and keeps their thinking invisible so as to allow for the semblance of learning, an illusion that equates scores on a test with evidence of learning. However widespread and ubiquitous this practice is—and make no mistake, teachers all over the world have been forced into accepting this compromise—this illusion, some might say delusion, about what real learning is serves no one well, least of all students who wind up being ill prepared for future learning (Schwartz, Sadler, Sonnert, & Tai, 2009). It also robs the teacher of the ability to confront students' misconceptions and design experiences to advance their understanding.

In contrast, our colleague Tina Grotzer, who directs the Complex Causality Project at Harvard Project Zero, has designed a series of modules on scientific concepts that directly confronts students' misconceptions and seeks to reveal their thinking so as to restructure it. For instance, in a unit on density, students watch as the teacher drops two candles of equal diameter, one short and one long, into two containers of liquid. The shorter candle floats while the larger candle sinks. Students are asked to write what they observed and explain why the event they witnessed happened. In doing so, students are encouraged to develop and put forth theories of explanation drawing on their scientific knowledge. Thus, at the outset students' thinking is surfaced through their words and drawings. The teacher then removes the candles from the two containers and switches them. This time the larger candle floats and the smaller one sinks; an unexpected outcome for most students. Again, students are asked to write about what they observed and to develop an explanation. Students then share their reactions and discuss how the simple experiment changed where they focused their attention. As the discussion unfolds, students become aware that though both liquids appear the same, they must differ in some respect and that sinking or floating is not a matter of simple linear causality in this instance but depends on the relationship between the liquid and the object placed into it.

By continually exposing students' thinking and pushing it forward through discrepant and unexpected events, the science teachers working with the Complex Causality modules stay in touch with students' developing understanding and are able to guide it throughout the lesson. At the same time, the teachers allow students' nascent theories to be the object of continual discussion, justification, and refinement, thus putting students in charge of developing their understanding and not merely providing them with information to memorize for the test. As this lesson demonstrates, making thinking visible benefits the teacher by providing an important assessment tool. At the same time, it helps to advance students' understanding.

Making students' thinking visible serves a broader educational goal as well. When we demystify the thinking and learning process, we provide models for students of what it means to engage with ideas, to think, and to learn. In doing so, we dispel the myth that learning is just a matter of committing the information in the textbook to one's memory. School no longer is about the "quick right answer" but about the ongoing mental work of understanding new ideas and information. Vygotsky (1978), writing about the importance of the sociocultural context of learning in providing models, stated, "Children grow into the intellectual life of those around them" (p. 88). As educators, this quote provides a powerful metaphor for what it means to educate another. Taking this quote seriously, we must then ask ourselves, What kind of intellectual life are we

presenting to our students in our individual classrooms and in our school as a whole? What are my students learning about learning? What messages am I sending through the opportunities I create for my students about what learning is and how learning happens?

When we learn anything, we rely on models. We attend to what and how others are doing things, and we imitate them. This is as true and important for learning to learn and learning to think as it is for learning to dance or to play baseball. Imagine aspiring to be a great dancer without ever having seen great dancing. The novice imitates experts in an ever-advancing series of approximations of excellence, learning what works best for him- or herself along the way. Consequently, the students in our charge need to see an image of us as thinkers and learners that they can imitate and learn from. They need to see and hear others' perspectives, insights, and questions as they advance in their own understanding. Students need to see how others plan, monitor, and challenge their own thinking in ways that move them forward. Students need to see that all learners make mistakes and that learning often occurs from reflecting on those mistakes.

The important role that models of thinking and learning play helps us to see that an education is much more than the delivery of content. A quality education is also about the development of the habits of mind and thinking dispositions that will serve students as learners both in our own classrooms and in the future (Costa & Kallick, 2009; Ritchhart, 2002). For this to happen, teachers must help students to recognize the key features and contexts for the use of various types of thinking. This means we need to draw on our understanding of what thinking is and the types of thinking we seek to foster so that we can name, notice, and highlight thinking when it occurs in class: recognizing a student who puts forth a new point of view, offers up a nascent theory or conjecture, proposes an explanation, makes a connection, sees a pattern, and so on.

This naming and noticing is a central part of becoming capable in particular activities (Johnston, 2004). As Ellin Keene (E. Keene & Zimmermann, 1997) notes, until students can name a process they cannot control it. As our attention is drawn to thinking, we become more aware of it, its uses, and effects. This awareness of occasions for thinking is the foundation of all dispositions (Perkins, Tishman, Ritchhart, Donis, & Andrade, 2000; Ritchhart & Perkins, 2005; Tishman, Perkins, & Jay, 1993). We must first spot opportunities for thinking; only then can we activate our abilities. Without this noticing, our skills and knowledge lay inert and unused. As educators, we want students who not only can think but who *do* think. Thus, the visibility of thinking, both their own and others', provides the foundation for dispositional development. Once teachers start noticing and naming thinking, that is, making it visible, they as well as their students become more aware of thinking and it becomes difficult not to notice it in the future

(Harre & Gillet, 1994). When we make the thinking that happens in classrooms visible, it becomes more concrete and real. It becomes something we can talk about and explore, push around, challenge, and learn from.

In Lisa Verkerk's fifth grade classroom at the International School of Amsterdam, featured on the DVD, she frequently names and notices students' thinking as a way of providing specific feedback on learning rather than giving generic praise, that is, comments about good work or a job well done that only tell students they have pleased the teacher more than providing substantive information about their learning. Lisa draws students' attention to the thinking they have done. Commenting to two students who have worked to build their understanding of a series of photographs that highlight the plight of refugees, Lisa tells them, "I like how you have used your prior knowledge and what you already know to really build explanations of what is going on in these photographs. You've really looked closely and used evidence to back up your reasons." This kind of feedback provides students with a clear picture of the thinking they have done and a reference point they can draw on in their future learning.

HOW CAN WE MAKE THE INVISIBLE VISIBLE?

Making thinking visible is not without challenges. As we have discussed, we first must be clear in our own minds what thinking is. This allows us to make thinking visible by naming and noticing it as it occurs. In addition, for thinking to occur students must first have something to think about and be asked to think. We as teachers must create opportunities for thinking. However, even when opportunities for thinking are present, we must still recognize that thinking is largely an internal process, something that happens "under the hood" as it were. In the remainder of this chapter, we look at ways we as teachers can make students' thinking more visible through our questioning, listening, and documentation practices.

Questioning

The issue of asking good questions has long been a focus in education, particularly as it relates to students' thinking and the creation of opportunities for learning. Open-ended questions—as opposed to closed-ended, single-answer questions—are generally advocated as a means of pushing beyond knowledge and skill and toward understanding. In addition, Bloom's taxonomy, which was discussed in Chapter One, is often suggested as a template to help teachers ask better questions. The usual advice given is to make sure questions go beyond the knowledge level and push for application, analysis, synthesis,

and evaluation. Moving beyond simple recall in questioning is certainly good advice and likely to create more opportunities for thinking. However, many teachers find that trying to ask more "higher-level" questions can feel stilted. Furthermore, teachers may find it hard to come up with such questions in the moment. Even when such questions are formulated and asked, they might not do as much to illuminate students' thinking as we might hope, particularly if it is perceived that the teacher is looking for a specific answer. In such cases, students will merely play the game of "Guess what's in the teacher's head."

A more flexible way of approaching the issue of questioning would be to think about how we as teachers can ask questions that (1) model our interest in the ideas being explored, (2) help students to construct understanding, and (3) facilitate the illumination of students' own thinking to themselves. Each of these represents not so much question types—though they may be classified this way—as they represent goals we have as teachers: to model intellectual engagement, to support students in constructing understanding, and to help students clarify their own thinking. In contrast, a lot of the questions asked in classrooms are about testing students' memory of what was taught. Such questions do not engage learners with ideas; they merely review content.

Modeling an Interest in Ideas. Asking authentic questions—that is, questions to which the teacher does not already know the answer or to which there are not predetermined answers—is extremely powerful in creating a classroom culture that feels intellectually engaging. Such questions allow students to see teachers as learners and foster a community of inquiry. John Threlkeld, an algebra teacher at Colorado Academy in Denver, is a master of this. In observing his classroom over the course of a year, Ron Ritchhart often noticed he generally began his classes with questions such as, "You know, I was wondering if that pattern we looked at yesterday might be present in any of the other situations we have looked at in this unit. What do you think?" Or, "Yesterday, Amy found an interesting way of approaching the problem, and I was wondering if that would always work?" Martin Nystrand (Nystrand, Gamoran, Kachur, & Prenergast, 1997) and his colleagues have shown that these kinds of authentic questions, though exceedingly rare in most classrooms, have a positive influence on student engagement, critical thinking, and achievement. One can also think of authentic questions as being generative in nature. That is, they generate or help to promote class inquiry and discovery, framing learning as a complex, multifaceted, communal activity as opposed to a process of simply accumulating information. True generative questions have legs. They propel learning forward.

Good “essential questions” fall into this category of being generative as well. In her ninth grade humanities class, Kathy Hanawalt at Clover Park High School in Washington State uses a set of essential questions to focus her students on the fundamental issues of truth, perspective, and universality that lie at the heart of history and literature. Above her whiteboard on construction paper are five questions: What’s the story? What’s the other story? How do you know the story? Why know/tell the story? Where’s the power in the story? These questions serve as the touch points for ongoing exploration of everything that happens in the class. When Kathy first began using the questions in her class, she found that her students were particularly captivated by looking at the notion of the other or hidden story to understand not only the events they were reading about but also those events around them. Even in simply sharing a recent event, she found that students were likely to ask the class, “Yeah, but what’s the other story?” This question truly became essential and generative to students’ learning. When reading accounts of history, current events, or political essays, the notion that there is another story and that uncovering it is necessary to truly understand people and events propelled learning and engaged students in Kathy’s classroom. Using questions such as these supports students’ learning of how to learn by sending messages that learning history involves uncovering the stories.

The provenance of authentic questions doesn’t rest solely with the teacher, however. When students ask authentic questions, we know they are focused on the learning and not just the completion of assignments. Students’ authentic questions are a good measure of their intellectual engagement. Middle school science teacher Paul Cripps in Wyoming says that students’ questions are his best assessments of their learning. “I judge my students not by the answers they give, but by the questions they ask,” he says. When observing in John Threlkeld’s class Ron often heard him exclaim, “Great question!” At one point, Ron asked him, “What makes something a great question?” Without missing a beat he said, “Oh, a great question is one that gets us all thinking, including me.” Through students’ questions we get a glimpse into their thinking: What issues are engaging them? Where is there confusion? Where and how are they making connections? Where are they seeking clarification? Once one student has offered up his or her insights or confusion, we often see a ripple effect in the classroom that helps to produce the excitement and energy needed for learning.

Constructing Understanding. Our research team recently looked at teacher questioning in the Cultures of Thinking Project. We observed that when teachers focus on making thinking valued and visible in their classrooms, their questioning shifts away

from asking review or knowledge-based questions to asking more constructive questions. (Note: More facilitative questions were also asked; these are discussed in the next section of the chapter.) Constructive questions can be thought of as those that help to advance understanding. These are questions that ask students to connect ideas, to make interpretations, to focus on big ideas and central concepts, to extend ideas, and so on. In studying teachers’ questions in secondary mathematics classrooms, Jo Boaler and Karin Brodie (Boaler & Brodie, 2004) note that such questions not only serve to activate students’ thinking but also to “guide students through the mathematical terrain of lessons” (p. 781). Constructive questions act, not as nice add-ons to make sure some so-called higher-order thinking is happening, but as the guideposts and goals for the lesson itself. Teachers’ constructive questions navigate the important ideas and conceptual anchors in such a way as to ensure that they are not missed by students. Whereas teachers asking review-type questions tend to do so because they want to assess what students know and remember, teachers who ask constructive questions do so because they want to guide, direct, and push forward students’ understanding of important ideas.

In her first grade class at the International School of Amsterdam, Stephanie Martin’s students were learning about their senses. One of the goals of the unit was for students to be able to connect each of their senses with the kinds of information that can be gathered from it. In one lesson, Stephanie’s students felt an object in a box and then described aloud what kinds of things they felt: squishy, soft, round edges, corners, and so on. Based on these responses, Stephanie then asked students to begin to make interpretations and assumptions: “What do you already know just by feeling it?” Followed up by “What do you not know by feeling it?” and “What does your feeling of it make you wonder?” These questions might not seem complex or difficult on the surface, but they go to the heart of what Stephanie wants her students to understand: What information do we get from each of our senses; and what can we do with that information? Without such questions, the activity of feeling a mystery object would be little more than a game and unlikely to yield much learning.

Cathy Humphrey in her middle school algebra class in California’s Silicon Valley uses questions to make sure that students aren’t merely learning rote procedures but are focusing on the underlying mathematics (Boaler & Humphreys, 2005). Two entire class periods are focused on the constructive question: Why is two times the quantity n minus 1, that is, $2(n - 1)$, equal to $2n - 2$? Cathy asks her students to explain in their own words why it is true and to develop arguments that will convince a skeptic: “If you were gonna try to prove to someone that this always would work, how would you do it?” Cathy’s intent here is not to review the distributive property, which students haven’t formally

been taught, but to focus students on how to think about the idea of “quantities” as expressed when using the parentheses in mathematics. She wants students to be able to understand that such quantities are entities unto themselves that can be operated upon. In doing so, she is also pushing her students to go beyond arithmetic explanations; that is, trying to prove something true by simply substituting in a number for n to see if it works. As useful as such test cases might be, they don’t really constitute a proof, so Cathy asks her students to think like a skeptic and try to prove the equality. Anthony shows his understanding when he responds, “Okay, it’s just like you are doing those two (meaning the quantity $n - 1$)—you’re doing n minus one twice and you’re adding it together . . . and then it’s the same thing as doing two n minus two because you’re still gonna subtract two.”

As these two examples illustrate, constructive questions frame the intellectual endeavor in which students are to be engaged and point them toward uncovering fundamental ideas and principles that aid understanding. This may seem like a tall order to place on teachers’ shoulders. However, this is precisely where the thinking routines that will be presented in Part Two of this book can be useful. The steps of each of the routines outline a set of constructive moves that students can make to facilitate their understanding and make their thinking visible. For example, in Stephanie Martin’s lesson mentioned earlier, she began her lesson by adapting the See-Think-Wonder routine into Feel-Think-Wonder. Her initial question, “What did you feel when you reached into the mystery box?” directs students to making observations based on touch. Then, “What do you think about what you felt?” moves students toward interpretations and the exploration of possibilities. Finally, Stephanie asked her students, “What are you left wondering about the object in the box given that we were only able to feel it?” When you read about other routines in Part Two, keep in mind their constructive nature that you as a teacher can direct toward the specific ideas and concepts you want students to explore and understand.

Facilitating and Clarifying Thinking. “What makes you say that?” This question is often one of the most fully integrated thinking routines in the classrooms of teachers with whom we have worked. You’ll see many of the teachers featured on the DVD integrating this question into their interactions with students. (You can also read more about its use in Chapter Six.) At Bialik College, where teachers have formed professional learning communities as part of the Cultures of Thinking Project, one teacher remarked, “‘What makes you say that?’ isn’t just a teaching tool; it is a way of life.” She said she learns so much more and has much deeper conversations with friends and family

just by asking “What makes you say that?” instead of responding right away to people’s comments. Teachers remark that the wording of this question seems to strike just the right tone with people and invites them to elaborate on and clarify their ideas in a nonthreatening way. Although “Tell me why?” or “Give me your reasons and evidence for that statement” serve the same role, they seem not to convey the same level of openness and interest.

This simple yet powerful question is a perfect example of the kind of question that can facilitate and clarify the learner’s own thinking. In using facilitative questions, the teacher’s goal is to try and understand students’ thinking, to get inside their heads and make their thinking visible. Again, it is switching the paradigm of teaching from trying to transmit what is in our heads to our students and toward trying to get what is in students’ heads into our own so that we can provide responsive instruction that will advance learning.

Jim Minstrell, a former secondary science teacher who now directs research efforts in science education aimed at uncovering students’ thinking, studied his own teaching and carefully examined the way he interacted with his students through his questioning during his time at Mercer Island High School in Washington State. He coined the term “reflective toss” to describe the questioning sequence he uses to facilitate and clarify students’ thinking (Zee & Minstrell, 1997). Traditionally, we have often characterized the discourse of the classroom as originating from the questions teachers ask. However, Jim takes students’ comments and ideas as the starting point for dialogue. In the reflective toss, the teacher’s first goal is to try to “catch” students’ meaning and try to understand their comments. If meaning can’t be grasped immediately, then a follow-up question, such as “Can you say more about that?” or “I’m not quite following you, can you say what you were thinking in a different way?” is asked. Once the meaning is grasped by the teacher, then the teacher “tosses” back a question that will push the student to further elaborate and justify their thinking, both to the teacher and to themselves. For instance, Jim might ask students, “What does that tell you then?” “What do you think you were basing that on?” or even our old standby, “What makes you say that?”

This sequence of questioning has a huge advantage over the traditional question, respond, evaluate pattern (Cazden, 1988) that we find with review-type questions in that it facilitates students clarifying their own thinking and ideas in such a way that new understanding is developed that the student owns. Rather than being a passive agent who merely takes in what the teacher has said, the student becomes an active agent in constructing his or her understanding. British researcher Douglas Barnes, who has studied the role of language in shaping learning throughout his long career, states that

the more a learner "is enabled to think aloud, the more he can take responsibility for formulating explanatory hypotheses and evaluating them" (Barnes, 1976, p. 29).

Listening

Ron Ritchhart recalls a pivotal episode from when he was a mathematics coach. Rather than being a one-off, it was an episode that seemed to repeat itself over and over again at the various schools where he was working: "I would teach a mathematics lesson in one teacher's classroom with other teachers from the same grade level observing. After we had debriefed the lesson, the observing teachers were encouraged to teach the lesson and share their experience with the group in our next session together. Invariably, at these follow-up sessions a teacher would remark, 'I wrote down all the questions you asked, and I was very careful to ask the same questions, but my students didn't respond the same way as when you did it.' This happened enough times among the teachers with whom I was working that I decided to investigate what was happening."

What he observed was that indeed the teachers were doing their best to ask the same key questions—questions that were generally constructive in nature—he had asked at pivotal points in the lesson. However, students often gave short answers or seemed to be guessing rather than thinking mathematically. This wasn't a problem with the students, however, as Ron had rotated his demonstration teaching among all the classes. He also noticed that when students didn't respond the way the teachers had expected, the teachers were often stumped about how to respond and tended to just move the lesson forward. Ron concluded, "It is one thing to ask good questions, but one also has to *listen for the answers*." The teachers, in part because they were taking risks and trying new ways of teaching mathematics with which they were unfamiliar, were so focused on what they were going to do or say next that they often failed to listen to students. This had two effects on the class: first, it inadvertently sent a signal that the teacher was not as interested in hearing the students' thoughts as in hearing a specific answer. As a result, the students played "Guess what is in the teacher's head" rather than stating their true ideas and understanding. Second, by not listening, the teachers had trouble being responsive to students through appropriate follow-up (facilitative) questions. Good questions, that is, questions that drive learning, don't come from some prescribed list or set of guidelines; they arise in response to students' contributions. If we don't listen to those thoughts, we rob ourselves of the information we need to be able to ask good questions. If we don't first "catch" students' meaning, we will be hard pressed to "toss" back a question that pushes them to elaborate or clarify their thinking.

In the Reggio Emilia preschools of Italy, they espouse the idea of a pedagogy of listening. Carla Rinaldi, the director of the preschools and executive consultant for Reggio Children, holds that listening must be the basis of the learning relationship that teachers seek to form with students. Within such a learning context, "individuals feel legitimated to represent their theories and offer their own interpretations of a particular question" (Giudici, Rinaldi, & Krechevsky, 2001). Listening conveys a sense of respect for and an interest in the learner's contributions. When this is present, students are more willing to share their thinking and put forth their ideas, just as we as adults respond more when we know the person we are talking with is interested in us and our ideas. These same sentiments are eloquently expressed by poet Alice Duer Miller (1915) in her observation that "listening is not merely not talking, though even that is beyond most of our powers; it means taking a vigorous, human interest in what is being told us." This vigorous human interest allows us to build community in the classroom and develop interactions that pivot around the exploration of ideas. Our listening provides the opening for students to make their thinking visible to us because there is a reason to do so.

As teachers, our listening to students provides a model for our students of what it means to listen. In classrooms where teachers routinely ask, "What makes you say that?" they invariably notice that students soon pick this up as an appropriate and useful way to respond to one another's contributions. Developing active listeners isn't just a nice side benefit, however. Brigid Barron (2003) studied group interactions among sixth graders solving mathematics problems collaboratively to try to identify what made some groups successful while other groups floundered. In her paper, "When Smart Groups Fail," she found that group success was far less dependent on the academic skills of the group than it was in the group's ability to listen and respond to one another's ideas. Successful groups engaged with the ideas of the group members, echoing back the ideas that were presented and asking clarifying and probing questions of one another. In these groups, individual members did not just talk; they also listened and sought greater equality among all group members. This allowed them to build on one another's ideas and advance far beyond groups with academically more proficient students.

Documenting

Another tool for making students' thinking visible is the use of documentation: recording of the class's investigation on the whiteboard, photographs of students working, audiotapes of the class discussion, written notes of students' ideas and contributions, students' papers and drawings, and so on. To those new to documenting

students' thinking, it might be easy to confuse documentation with merely recording what the class has done, a sort of archive of activity through the collection of various forms of documents. However, to be useful to both teachers and students, documentation must extend beyond this. At its heart, the documentation process, which has its origin in the Reggio Emilia preschools but has since moved to include all grade levels through the work of the Making Learning Visible project at Harvard, is focused on the learning process itself by trying to capture the events, questions, conversations, and acts that provoke and advance learning over time.

Our Project Zero colleagues, Mara Kerchevsky, Terri Turner, Ben Mardell, and Steve Seidel, have been investigating how documentation supports students' learning from early childhood through secondary school. They define *documentation* "as the practice of observing, recording, interpreting, and sharing, through a variety of media, the processes and products of teaching and learning in order to deepen learning" (Given, Kuh, LeeKeenan, Mardell, Redditt, & Twombly, 2010, p. 38). Embedded in this definition is the idea that documentation must serve to advance learning, not merely capture it. As such, documentation includes not only what is collected but also the discussions and reflections on those artifacts. In this way, documentation both connects to the act of listening and extends it. To capture and record students' thinking, teachers must be vigilant observers and listeners. When teachers capture students' ideas, they are signaling that those ideas and thoughts have value and are worthy of continued exploration and examination.

In Stephanie Martin's first grade class, as students share what they felt inside the mystery box, she records their individual contributions on sticky notes and places them on chart paper. This allows students to see that their ideas have value and exist as contributions to the class's discussion. The documentation of the class's observations about what was felt then becomes a foundation that Stephanie and the class can connect to as they move on to discuss what they think and wonder about those observations. The documentation demonstrates Stephanie's listening and provides the basis for the ongoing class conversation about the object in the mystery box. In Brigid Barron's (2003) study of successful groups, she found similar examples of documentation happening among students themselves. Documentation of the ongoing problem-solving process allowed all group members to access the thinking of the group and feel a sense of ownership of it. The documentation also allowed the group to monitor progress and make contributions and ask questions at appropriate points in the process that would advance the understanding of the group. In contrast, unsuccessful groups were often

those where the written work of the group was done by a single member and not easily accessed by others. This practice led to disenfranchisement of some group members.

Documentation of students' thinking serves another important purpose in that it provides a stage from which both teachers and students may observe the learning process, make note of the strategies being used, and comment on the developing understanding. The visibility afforded by documentation provides the basis for reflecting on one's learning and for considering that learning as an object for discussion. In this way, documentation demystifies the learning process both for the individual as well as the group, building greater metacognitive awareness in the process. For teachers, this reflection on students' learning functions as assessment in the truest sense of the word. Documentation, while not used for grading, often provides a rich and potentially illuminating glimpse into students' learning and understanding. To uncover this richness, we often need more sets of eyes than ours alone. Sharing documentation with colleagues can lead to rich discussions of learning and allow us to see and notice aspects of students' thinking and implications for instructions that we, as teachers working on our own, might easily miss. We explore how this collegiality can facilitate rich professional learning in Chapter Eight as well as on the DVD clip of a professional learning group using the LAST protocol to discuss a piece of documentation.

When we as teachers frame our core activity not as delivering the curriculum to a passive group of students but as engaging students actively with ideas and then uncovering and guiding their thinking about those ideas, the strategies presented in this chapter take on a new sense of urgency and importance. We make students' thinking visible through our questioning, listening, and documenting so that we can build on and extend that thinking on the way to deeper and richer understanding. These core practices provide the backdrop for our discussion of thinking routines in Part Two of this book. Rather than seeing the routines as separate practices, it is important to view them as structures that grow out of and extend our ongoing practice of questioning, listening, and documenting. As you will see, thinking routines are effective and really come alive in classrooms when they emerge from and are linked to enduring efforts to make thinking visible. Look for these connections as you read through the Pictures of Practice accompanying each of the thinking routines in Part Two of this book.