3 "How Do We Begin?"

Modeling Our Inquisitiveness

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We all know men and women we admire and look up to. For years, my model of daring and adventurousness has been Rear Admiral Richard E. Byrd, the first to fly over the South Pole and open exploration of Antarctica by air back in 1928. I've also looked up to my grandfather, Llewellyn Ray Ferguson, because he was the man who always asked me, "Johnny, did you ever wonder?" about various strange phenomena. My mother, Elizabeth Lockwood Ferguson Barell, has always been a model for me of a person with a deep love of the English language and its proper usage. She had a keen mind and was fond of asking, "How do you know?" about the uniqueness of snowflakes and grains of sand.

And my father, Ralph Barell, has become one of my most steadfast models of persistence in the face of seeming adversity with his constant message: "There's no such word as *can't*," a message delivered many years ago when I was in high school and not exactly interested in hearing it. But it sunk in very deeply.

We all know people whose lives reflect excellence in many qualities. I can think of several right off the bat:

- The 2015 women's World Cup Championship soccer team for their pursuit and achievement of excellence
- Jackie Robinson for his demeanor—his ability to remain cool, modest, and focused on baseball while being taunted with outrageous racial slurs
- Steve Jobs for his relentless pursuit of innovation and perfection
- Oprah Winfrey for her ability to interview; ask good, penetrating questions; listen; and share a stage with celebrities and people with good stories

I mention these professionals here because they serve as role models and can help us create a classroom wherein we encourage students to ask good questions and search for answers. If we really want students to take the risk of being curious and expressing such to us, we need first to create an invitational classroom environment, one wherein we lead by sharing our own curiosities and questions about the world and about ourselves.

One of the best ways to create this environment that invites students to closely observe and wonder about something that is intriguing, strange, mysterious, and novel is to model our own inquisitiveness, that is, by sharing those experiences, circumstances, objects, and ideas that we find fascinating and lead to our pursuit of answers.

How do we model our inquisitiveness? Simply by sharing with our students what we're now or have been curious about:

> "I've often wondered how the first black player in baseball, #42 Jackie Robinson, was able to remain so seemingly calm and controlled while other players taunted him mercilessly . . . "
>
> "It was so much fun for me to watch the 2015 women's soccer team beat Japan in the final game. I was fascinated by Carli Lloyd's ability to score three goals within sixteen minutes. How'd she do that?" (Later reports suggested that constant practice led to her successes.)

The men and women we admire in our lives can serve as examples of our own curiosity:

> "How did Admiral Byrd plan and organize his very successful expeditions to Antarctica in 1928, 1933, 1939, and 1946? What does it take to be so successful?"

All we have to do is honestly share with our students our wonderings at appropriate times, such as class meetings, as they relate to our curriculum or what we've written in our Inquiry Journals.

INQUIRY JOURNALS

One of the best ways I know of to become more aware of my own inquisitiveness has been to keep my own journals, a task I first undertook when I was about thirteen and became fascinated with Antarctica—with Admiral Byrd, his expeditions, and the animals, geography, geology, and glaciology of this region.

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One of my first entries was this: "When I am fifty I hope to have been to the Antarctic." I set this as a goal, searched all different ways of achieving it (as a scientist, naval officer), and sailed to Antarctica McMurdo Sound on Byrd's flagship, *USS Glacier* (AGB-4), when I was less than half that age.[1]

TRY THIS!

One of the very first things we can do if we are serious about fostering inquiry in our classrooms is to reflect on our own lives with these questions:

- Who have been my models of inquisitiveness—in my family and elsewhere?

_____

_____

- How did they foster my own inner drive of curiosity to ask questions and investigate the world to find answers?

_____

_____

- Who might have inhibited my own searches for meaning and understanding? How did they do that?

_____

_____

- What have I learned in reflecting on my own personal story?

_____

_____

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We can ask these questions quietly as we drive home from school. We can take some extra time to sit down with a notebook or journal and jot down what we observe in our own history. We can also use an Inquiry Journal to begin our own journey of reflecting on the topics and subjects we find fascinating in our daily lives. Figure 3.1 lists a set of stems we can use for our own Inquiry Journal. These stems can also be used by students

1. For this story see Barell (2007b), *Quest for Antarctica: A Journey of Wonder and Discovery.*

when you wish to have them begin to reflect on their lives in and out of school and while working on various units.

Figure 3.1 Inquiry Journals

Here are some inquiry starters:

I noticed/observed/saw/experienced. . . . and my thoughts/feelings/questions are . . .

What I am curious about . . .

It says, ". . ." but I do not yet understand . . .

I saw . . . and what I want to know is . . .

I really wonder why . . .

This reminds me of . . . relates to . . .

What's important here is . . .

What I'm trying to understand/figure out . . .

Maybe . . . Perhaps . . . Might it be that . . . ?

The big ideas here are . . .

This makes me feel . . . What I feel is . . .

What if . . . ?

What I'm learning about my questioning, thinking, searching for answers . . .

What kinds of questions am I not asking? Why?

What do I notice about my feelings during inquiry and questioning? Alone? With friends?

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Here's one recent journal entry:

3/1/15
38,000 feet en route from JFK to San Francisco

Flying over snow-covered flat plains divided into very large squares. But what's intriguing is that this plain is bounded on either side—a width of perhaps 20 miles or so—by low hills all wrinkled up looking at first like folds in the human brain!

(Continued)

(Continued)

1. How did mountains arise on either side?
2. What tectonic forces forced the land plains to buckle on either side?
3. Or was it the case—as it sometimes is with valleys—that they represent effects of erosion—washing away sediments?
4. Now [after a few minutes of flight at 500 mph] another batch with corrugated foothills.
5. What does this tell us about how mountains form?
6. How like processes of subduction and collisions that form Rockies?
7. Then—all of a sudden—a dark flat patch looking as if a farmer had cleaned off the snow—1/4 × 1/2 mile.
8. Or maybe covered with black tarp that absorbs sun and melted snow! What grows beneath?

Summary: Earth forces continually reflect this as a dynamic planet—unlike Mars that has no mountain ranges—dead now, but has it always been so?

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Using an Inquiry Journal of our own can become quite revealing:

- What kinds of questions do we ask? Not ask? Why?
- What subjects fascinate us the most? Why?

Becoming reflective about our own inquiry processes, our own thinking—critical and creative (however we define those terms)—is in my judgment a *sine qua non* of fostering inquiry with others. We must be able to show our own curiosities; our own searchings for meaning and understanding; our own doubts, difficulties, and perplexities to our students when it is appropriate. We must show that we do not know everything—that we are always questing for new knowledge and deeper understanding about ourselves and our worlds.

For example, what I've learned over the years about my own inquiry is that I'm usually fascinated by events in the natural world: climate change; our mostly successful attempts to explore the cosmos and our solar system (e.g., Curiosity Rover on Mars: https://www.nasa.gov/mission_pages/msl/images/index.html); about claims that go unproven (e.g., "the best way to stimulate the economy is . . . ").

The kinds of questions I jot down and think about are often causal, such as "Why did this happen?" or "Why didn't this happen?" and "How do you know that? What's your evidence?"

Most recently I had the pleasure of working with faculty of the Heidelberg International School, where, as always, I modeled keeping my own journal. After departure, I received this note from Allyn Raw, principal of the primary school:

> I have never been one to keep a journal or diary and my office and home are splattered with to-do notes, but very few address questions that I have. Once I began to put my thoughts and wonderings down on paper I found a powerful impetus to want to know more and develop questions about the world around me. Sharing my personal Inquiry Journal (aptly a "Curious George" notebook) with students and teaching staff alike it was clear that this modeling of my own inquiries opened up new possibilities for inquiring with students. The modeling of how I developed my own inquiries made it clear to students that we can be inquirers forever. (personal communication, August 2015)

As Allyn has noted, our **modeling** may be the most powerful way to initiate inquiry with our children and students. Note also that, for Allyn, jotting down his curiosities became "a powerful impetus to want to know more." Yes, from imagining and wondering, to taking pencil to paper or jotting in our electronic journals, can provide the kind of motivation we need to pursue our inquiries.

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STARTING AT HOME AND ALL AROUND US

"Did You Ever Wonder?"

Searching our own family stories for examples of inquisitiveness can be a good place to begin identifying those persons who have positively affected our becoming inquisitive professionals who are often poking at the world to figure out what's going on, often being restless with the status quo and asking, "What if we did things this way?" and wonder about some of the fascinating mysteries in our natural world.

My grandfather was a scientist who worked for General Foods. He was the inventor of the first dietetic dessert, D-Zerta (https://relatedbyfoodjustaddwine.wordpress.com/2012/11/12/curious-food-10-d-zerta/comment-page-1/#comment-208). He was my model of inquisitiveness—always asking me when I was a little boy, "Johnny, did you ever wonder—"

"Why the sun appeared so large on the horizon yet much smaller at its zenith (a word he had already taught me)?"

"How we know that the Earth spins on its axis?"

"What happens if we mix this chemical substance with another?"

He always made these questioning sessions feel like a game, because, even though there was often a good or right answer, I always had an opportunity to try to figure things out, like why the sun appeared different at various locations in the sky.

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"How Do You Know?"

My mother modeled a good, healthy skepticism for me when her dad asked her to look at all the lovely snowflakes falling to Earth one January day in the front yard of their LeRoy, New York, home.

"You know, Betty," he said, "the amazing thing about those snowflakes is that each one is unique. You know, like your fingerprint. Every one is different from the other."

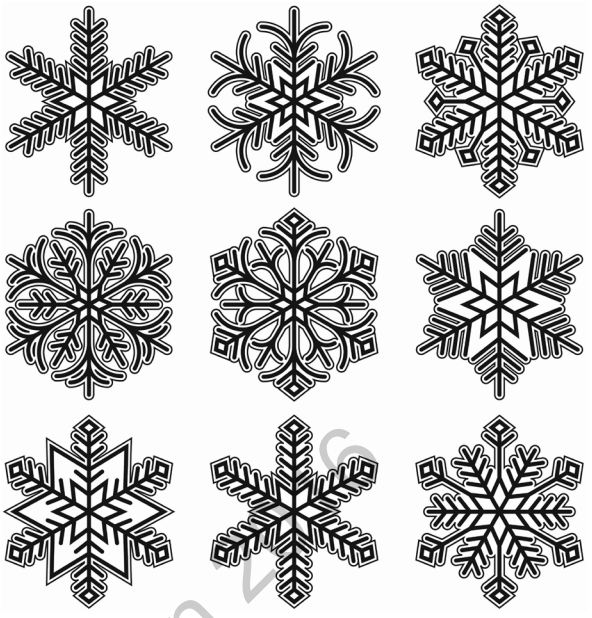
"*Really*!" she must have responded. "How do you know?"

My grandfather used his scientific knowledge to explain his claim.

"Well, I don't believe it," she said.

"What?" he exclaimed in disbelief.

"No. Have you seen all the snowflakes in the world?"



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And that probably was the end of the discussion and I have always imagined my scientist and US Patent owner (for D-Zerta) grandfather marching off in a huff at the audacity of his teenage daughter, Elizabeth.

John McPeck has defined **critical thinking** as "a certain skepticism" about what to believe, think, and do. Here is my model of what this definition is all about.

When I told my mother that I thought all grains of sand were unique, she said, "And I don't believe that either. Have you or anybody else seen them all?"

Obviously not.

So, we model our own inquisitiveness perhaps by introducing our own exemplars of people who asked good questions. We can do this by reflecting on these experiences and writing about them in journals.

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"What would happen if . . .?"

Once again, Engel's recent (2011) research seems to confirm what to us might seem like common sense: Teachers who encourage their students see enhanced wondering and curiosity (p. 635). When we model our own curiosity, we tend to spark the same in our students (p. 636). Engel reports on teachers' observing students in two groups working with a subject, say in science. One group had a work sheet and was encouraged to complete it with the correct answers about mixing water, vinegar, and baking soda and dropping raisins into it. For the other group, Engel said to students, "You know what, I wonder what would happen if we dropped one of these [Skittles] into the mixture?" She did so, then exited the premises while a video camera recorded what occurred: Students were much more likely to play "with the materials, dropping raisins, Skittles, and other items into the liquid, stirring it, and adding other ingredients." Thus, they were playing, experimenting, and wondering "What would happen if?" They were "messing about" with Skittles.

Thus, our own modeling behavior can have a most powerful impact upon what our students do. We can engage in "real-time" modeling of our own curiosity by bringing in items from the news or objects from our recent travels.

Modeling our own wondering, our own inquisitiveness, can lead to the very same behaviors on the part of our students, given opportunity and, as in the above case, encouragement and freedom to explore.

"What's News?"

Today the papers have stories about the conflict with ISIS, about immigrants from war-torn Syria; about climate change; and about the forthcoming presidential campaign. We can and should be asking lots of good questions about each of these situations. Other items that stir our imaginative wondering about the world include:

- Our fly-by of distant "former planet" Pluto—what did we find that might have been contrary to our expectations? How can we explain the icy mountains 11,000 feet high?
- An airplane powered entirely by the sun recently flew from Japan across the Pacific Ocean, landing in Hawaii after five days. How practical is this for the future of air travel? What if there had been an emergency? What if there were no sun for the length of the flight?
- United Airlines, the *Wall Street Journal*, and the New York Stock Exchange suffered computer "glitches" that experts claimed were not the result of outsider hacking. How do we know? What's the best balance between national security and personal freedom when it comes to our telephone and email conversations?

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The point is that the daily news is full of stories worthy of our inquiring minds and some of these stories, like the latter, can be shared with our students. What we find novel, complex, uncertain, and full of conflict will certainly communicate to students that it's fun to be curious, that all we have to do is become close observers of our world around us.

OBSERVE, THINK, AND QUESTION

One of the most important intellectual processes in life is that of observation. Yogi Berra is reputed to have once said, "You can observe a lot by

watching." Yes, indeed. Watching with a critical, discerning eye can help us identify some of those situations fraught with novelty, complexity, uncertainty, and conflict.

A thought routine that is helpful is one I call **Observe, Think, and Question** (see Figure 3.2). This involves spending time with resources rich in complexities, meaning there are multiple concept associations possible, many ways of viewing them from different perspectives.

I often bring in part of my seashell collection to share with students. My wife, Nancy, and I discovered these scallop shells on the beaches of Long Island many years ago. Now, however, they are almost nonexistent. Why? I also pass these shells around for close observation and inquiry because each is different, characterized by amazing symmetry of ridges and soft, pastel colors. How did they grow like this? Where? When? And what are they?

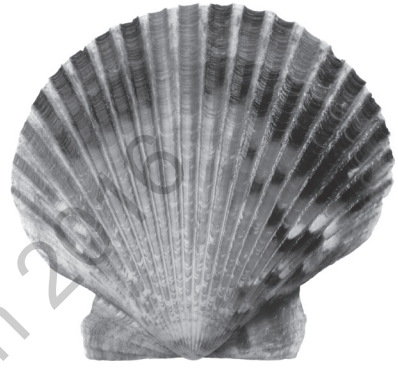

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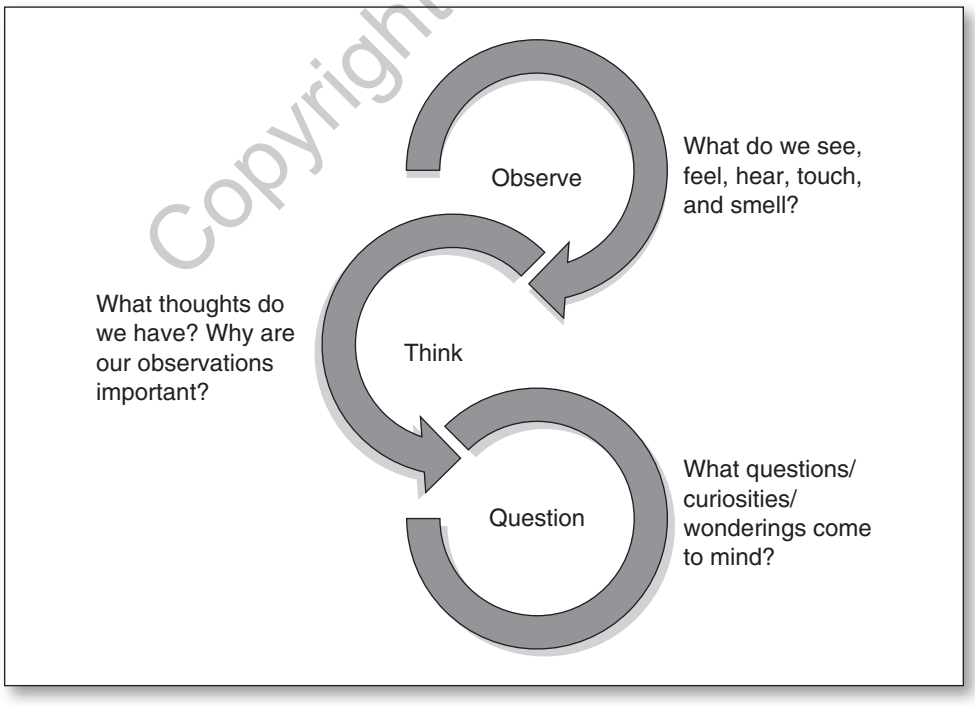
Figure 3.2 Observe, Think, and Question



TRY THIS!

Take a look at the image of the shell on the previous page.

Observe: What do you notice?

What characteristics intrigue and interest you?

What details are fascinating?

Even in black and white we can note these characteristics: shape, ribs and their patterns, color variations, size (and, if you held one in your hand, textures and aroma).

Think: What do these make you think of?

Why do you think these details are important?

Question: What do you wonder about this object?

What questions do you have?

If you were a marine biologist studying undersea life, what would you want and need to find out? It's often a help to create a professional role for students to facilitate their wondering.

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We often do this kind of activity in a large group with people having several of these real artifacts in front of them, to examine visually, feel, and, perhaps taste.

> By "enlarging children's acquaintance with objects, sensations, [and] physical attributes" we "expand children's experiences and provide ideas to think about, to wonder about, to use in creating and solving problems . . . [and we] encourage analytic thinking" (Copple, Sigel, & Saunders, 1984, p. 231).

Observation is the keystone of fostering inquisitiveness. In fact, we now know from Harvard researcher Ellen Langer that our powers of making distinctions, of noticing new things, "is literally and figuratively enlivening. It's the way you feel when you're feeling passionate" (Langer quoted in Lambert, 2007, p. 94).

Good observations, "the process of actively drawing new distinctions," Langer concluded, "produces that feeling of engagement we all seek."

Developmental psychologists have long known the importance of observing, of drawing distinctions for the learning of young children. By "enlarging children's acquaintance with objects, sensations, [and]

physical attributes" we "expand children's experiences and provide ideas to think about, to wonder about, to use in creating and solving problems . . . [and we] encourage analytic thinking" (Copple, Sigel, & Saunders, 1984, p. 231).

If we want our students to be intellectually and emotionally engaged and to grow in their abilities to differentiate, compare and contrast, and draw on prior learning, it stands to reason that we would offer them many and varied opportunities to become good, reflective observers, keen watchers, and capable distinction makers within all subjects we teach.

Recall the research from Engel in Chapter 2—providing students with opportunities to "follow their hunches" enlivens their curiosities and leads to deeper involvement in the learning process. Here, we're "messing about" with sea shells.

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Next Generation Science Standards

NGSS recognizes several "crosscutting concepts," such as observing patterns, discerning cause and effect relationships, and using and developing models and systems.

> Patterns exist everywhere—in regularly occurring shapes or structures and in repeating events and relationships. For example, patterns are discernible in the symmetry of flowers and snowflakes, the cycling of the seasons, and the repeated base pairs of DNA. (Next Generation Science Standards, 2013, p. 85)

Becoming a keen observer is one way to be able to recognize and understand patterns as they appear in nature, patterns that will invite reflection, wonder, and inquiry: "Why do they exist?"

Thinking Frames

What we have with Observe, Think, and Question is what some have called a "thinking frame" or "routine" (Ritchart, 2002). A "**thinking routine**" is one that aims to affect how we consider or respond to various kinds of experiences. They "direct and guide mental action" (p. 89).

Observe, think, and question (or wonder) is the kind of reflection that, once it becomes habit-forming, can provide us with the time to be keen observers of what's going on, to take what we see/feel/hear and relate it to what we know and then to pose meaningful questions about said observations.

If we teach our children and students to become careful, close observers of what intrigues them in nature, to reflect, and then to wonder, we have shared with them an invaluable tool with which to maneuver through the world. (Wondering, by the way, will emerge almost spontaneously from close observation and reflection.)

For example, whenever I'm at the Metropolitan Museum of Art or the American Museum of Natural History New York City, I need to remind myself to slow down as I stroll through the galleries. To take in an object, be it a T. rex fossil or a Monet painting, and spend some time observing very closely to find all the hidden details that escape our hurried first glances. To allow my mind to reflect on what I'm seeing: Does it relate to anything I know or have seen before? And what do I wish to know more about? Were Monet sitting here, what would I ask him?

STARTING SMALL

Once we feel comfortable with our own ways of inquiring, we can begin sharing some of our curiosities with our students by reading from our own journals (especially as a way of encouraging our students to do the same) or by thinking aloud.

Reverse "Show and Tell"

What ever happened to "Show and Tell"? I sometimes receive quizzical or noncommittal glances from teachers when I ask this question.

Well, we still have kids bringing in stuff from home to share with others.

In one Colorado classroom, I noticed copies of "My New Things" posted on a bulletin board. I asked for a copy and here's what I found inside:

"I got a new watch" (with picture of a watch showing 8:21).

"I got a Skylander Swash Buckler."

"I got an iPhone 6s"

What I wondered with the teachers of this school is to what extent we could use such first-grade presentations as opportunities to invite students' curiosities about these objects. Instead of telling us all about their new objects, could students show them and then ask their classmates to observe, think, and ask questions about them?

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"What I see that's interesting . . . "

"Makes me think of . . . " and

"I wonder . . . "

What would be the benefit of this?

Well, for one we would educate our students to be alert, to listen, and to determine what they'd like to know more about. We would educate the presenters to be comfortable responding to good questions.

Establishing the Invitational Environment

Other teachers are working on units that lend themselves to objects for observation and inquiry—like quilts, rocks, pictures of the Parthenon, copies of the Constitution, models of fire trucks, human skeletal bones, and so forth. A teacher once asked, "Would it be appropriate to spend the first two weeks of the year building the environment wherein we invite students to ask good questions?" After hearing some others' ideas, I said quite firmly that the answer was a resounding "Yes." If we want our students to become good observers, sharing their wonderings about objects and experiences with each other, and, if appropriate, proceed to search out answers to some of their questions, then we need to help them feel comfortable doing this. We need to model our inquisitiveness; we need to bring in objects to wonder about.

And what better way to establish such an invitational environment than spending quality time at the beginning of the year doing the following:

- Telling students that one of our top priorities this year will be to all share our wonderings and curiosities.
- Model our own inquisitiveness: "I've often wondered about: the change of seasons; why people sometimes lose items like car and house keys and reading glasses; what would happen if the ice in parts of Antarctica melted?"
- Bringing in artifacts relating our curriculum, observing, thinking, and wondering.
- Encouraging students to bring in their own favorite items for observation and wondering.
- Reflecting on these processes: "What have we been doing? Why do you think it's important to observe and wonder? How might all this relate to how we learn this year? How can we keep notes on what we do?"

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Reading Stories

Another way we can invite wonder is through books.

For example, while reading *Franklin in the Dark* (Bourgeois, 1986), we can do the following:

1. Show the cover of the book where we see a greenish Franklin leaning up against his dark shell with a frown on his face, surrounded by his toys in a room darkened by evening.
2. Share with students our observations and then invite their own: "It's dark outside . . . He looks sad . . . There's toys in his room." Then invite their wonderings: "Why is he outside his shell? Why is it dark? Why is he frowning?"
3. Wonder aloud about what this book might be about.
4. As we read, help students observe what the illustrations are showing us, such as Franklin dragging his shell, seeking advice from a duck, a lion, a polar bear . . .
5. Continue to wonder, "What do we think will happen next? Why? Why do you think Franklin is doing this?"
6. Perhaps pause as Karen and Mary Ellen did (Barell, 1995) to ask, "If you were Franklin, what would be your problem and how would you solve it?" This presents a different approach—engaging students in thinking creatively through what every story has—a real problem for the characters to solve. (It's interesting to compare what children think is Franklin's problem—"He's afraid of the dark"—with adults' versions—"He's suffering from anxiety neuroses or a withdrawal complex.")
7. When we complete the story, spend some time wondering about the characters and their motivations, how the author solved the problem, and what students liked or didn't like. What questions do we now have about the characters, the story, and our own writing of stories? Here is a good opportunity to engage in "wonder talk" as described by Lindfors (see Chapter 1).

Other examples of problems in stories:

- What is Fern's problem in *Charlotte's Web* and how does she solve it?
- Gary Paulsen's *Hatchet* is about a boy stranded in the Canadian wilderness. What are his specific challenges and how would you meet them?

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- John Green's *The Fault in Our Stars* tells the story of two teenagers dying of cancer. What would you ask the author were he available? What would you ask either of the main characters, Hazel or Augustus? Would you alter the story in any way? If so, how? If not, why not?

These are but a few ways we can create the environment wherein students feel comfortable and eager to wonder, speculate, raise their hands, and share their fascinations.

Cooperative Learning

One day in Peg Murray's third-grade classroom, she had her students engage in a cooperative learning experience. Students worked hard on their assignment that might have related to reading *Charlotte's Web* or discovering truths about the solar system.

At the end of the period, Peg asked for student reports. One student, let me call her Diane, stood up to face the class and offered this:

> "We did a good job and found out a lot about whales in the ocean. But some of our group didn't do good. Timmy wasn't listening and Jennifer kept talking to somebody else."

As I sat there with one group, I was amazed. Here was a third grader telling all her classmates and her teacher that two of her group members had not done what they were supposed to do. All students sat quietly and nobody laughed. This was serious business and Peg Murray had successfully created an environment where students knew they were to work cooperatively together, listen to each other's ideas, build on those that were helpful, and arrive at a reasonable conclusion for their task. When these expectations were not met, then we have to remind students of them, perhaps spend time working on becoming better, for example, at listening to each other.

In her sixth-grade classroom, Kerry Faber in Edmonton encourages a lot of small group problem solving while students are investigating mysteries ("Whodunnit?") or figuring out how to build model cities patterned after Leonardo's own model. What she has observed is students increasingly being more open to others' ideas about possible solutions.

In Grades 7 and 8, Mary Darr of Sandusky, Ohio, has observed students working in problem-solving groups (for instance, designing and building a habitat on Mars) learning how to deal with opposing points of view: "I learned," said one student group leader, Sydney, "that you have

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to learn to deal with arguments . . . " Another leader, Carlee, reflected, "I like my team because we were able to bounce ideas off each other and work well to get everything done" (Barell, 2012, p. 186).

All of the above require that we become good, active listeners, and very often this entails asking follow-up, probing questions, such as:

"I'm not sure I understand. Could you please say that again?"

"Is this what you mean?"

"Why do you think that? What are your reasons?"

REFLECTIVE PAUSE

Why do you think it is very important to create the kind of classroom environment where group work thrives and students can collaborate successfully?

Group work can be very valuable in any classroom especially if we value the following:

- Listening to each other, not just the teacher.
- Realizing that each student has good ideas and we can learn from these ideas.
- Solving problems with lots of different ideas.
- Having respect for others' ideas, especially ones different from our own.
- And what else?

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We know from research (Marzano, Pickering, & Pollock, 2001) that cooperative learning has positive effects:

> In general . . . organizing students in cooperative learning groups has a powerful effect on learning, regardless of whether groups compete with one another. (p. 87)

Perhaps this is the case because involving students in cooperative groups tends to create "positive *interdependence* . . . face-to-face promotive *interaction* . . . individual and group *accountability* . . . interpersonal and small group skills (communication, trust, leadership, decision making and conflict resolution) . . . *group processing* (reflecting on how well the group is functioning and how to function even better)" (p. 85, emphasis added). If we want, therefore, to foster a classroom where students become curious and persistent investigators of the mysteries that surround them, then it stands to reason that we will teach them how to listen to and work well with their classmates. We need to learn how to learn from each other (p. 85).

We can see within current curriculum standards the importance of posing good questions for challenges of increasing difficulty.

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CCSS Standards, ELA: Comprehension and Collaboration

CCSS.ELA-LITERACY.SL.3.1.C, Grade 3

> Ask questions to check understanding of information presented, stay on topic, and link their comments to the remarks of others.

CCSS.ELA-LITERACY.SL.5.1.C, Grade 5

> Pose and respond to specific questions by making comments that contribute to the discussion and elaborate on the remarks of others.

CCSS.ELA-LITERACY.SL.8.1.C, Grade 8

> Pose questions that connect the ideas of several speakers and respond to others' questions and comments with relevant evidence, observations, and ideas.

Here we can see the rising levels of expectation, from checking for understanding to connecting ideas and using evidence to support conclusions and claims—key elements in critical thinking.

MYSTERY BAG

I first learned of this way to challenge students to ask good questions from Robin Cayce in Chattanooga, Tennessee. She used a game called Mystery

Bag to help students learn to ask good questions. Robin placed a recognizable object in a bag. This object was something you would find around school or at home. Then she challenged students to ask questions about it that could not be answered yes or no. In other words, she wanted what we've called "higher-order" questions, ones you'll find at Levels II and III of the Three-Story Intellect you saw in Chapter 2 (Figure 2.1). The first time I tried it with adults we found it rather difficult to do, and Robin was doing it with fifth graders.

Another teacher in South Carolina said that her special education students especially enjoyed playing this kind of questioning game.

Kerry Faber in Edmonton, Alberta, used this kind of questioning experience after students became familiar with the Three-Story Intellect. She used it once for a unit on the middle ages, placing into a bag an object reflective of that time period at the commencement of the unit.

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TRY THIS!

You can simulate this kind of intellectual curiosity with a news story that presents the kind of novelty, complexity, uncertainty, and conflict we've mentioned as that which fosters inquiry. Clip out several news stories from a newspaper or magazine. Have your students work in small groups to choose a story whose headline intrigues them. Have them read the story once or twice and then jot down their observations—things they think are important. Then use these to pose questions that might help them figure out what's going on. Here we're using Observe, Think, and Question as a thinking routine.

Here's how this might go:

Here is a factual news item in a 2015 newspaper:

> Confirming many other observations, large randomized trials in 2006 and 2013 showed that a low-fat diet had no significant benefits for heart disease, stroke, diabetes of cancer risks, while a high-fat Mediterranean-style-diet rich in nuts or extra-virgin olive oil . . . significantly reduced cardiovascular disease, diabetes, and long-term weight gain. (Mozaffarian and Ludwig, 2015)

What questions should we ask about high- and low-fat diets? About nutrition? About these claims?

Think back to the Three-Story Intellect in Chapter 2. What questions might we ask at all three levels to understand some of the important ideas within such an article?

And, what questions would you ask a nutrition specialist about these results?

STUDENT-LED INQUIRY

At the Windows

One day Phyllis Whitin decided to stake a bird feeder outside the window of her fourth-grade classroom, and that made all the difference (Whitin & Whitin, 1997). Her students noticed the hummingbirds that came to the feeder and, because they kept Wonder Journals, they made precise observations that led to a whole year's study:

> I saw three or four hummingbirds. . . . They took several sips. The hummingbirds were yellow green color with a little gray, basically they chased [each other]. If one was at the humming feeder the other bird following would peck the other's body . . . The food is going to be half gone because of one hummingbird. (p. 3)

These observations led analyses of language usage—difference between "green" and "greenish," and about metaphors—it ate "like a shark."

Students also generated questions that guided investigations throughout the year:

- Do birds play tag?
- Where else do birds go?
- What kind of noises do birds make? What do different noises mean?
- What is the movement pattern of birds around the feeders?
- Do some birds travel in groups? (p. 22)

The Whitins describe all of the marvelous ways these fourth graders learned about birds: by making close observations; by collecting verifiable data and drawing conclusions; by creating illustrations, as scientists do, to enhance their understanding; and by developing that "healthy skepticism" we all need to use when working with a lot of information.

This is a marvelous story of how a year-long inquiry can commence with simple, yet fascinating, observations about birds seen outside our windows. The students' wonderings became a major focus of the entire year.

How to Survive an Earthquake

Sometimes you've thoroughly planned a unit, identifying your major concepts, essential questions, objectives, resources, and the like. Then you commence introducing students to a fascinating new subject.

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This happened with Judy Frohman, second-grade teacher in Livingston, New Jersey. The unit focused on Earth's Systems: Processes That Shape the Earth. Her unit plan, drawn from the New Jersey Core Science Standards, clearly identified essential questions ("How do wind and water change the shape of the land?"), understandings ("Earth's surface is continuously changing"), and objectives ("Students will be able to compare the position of the continents over time using maps").

Photo courtesy of Judy Frohman.

First model of earthquake-proof homes designed by Judy Frohman's second graders

She introduced the unit with pictures, videos, and demonstrations of "Earth events," namely earthquakes and their causes and movements of tectonic plates against each other (as tragically happened in Nepal in 2015 as the Indian subcontinent continues moving northward against the Himalayan Mountains).

Then, Jacob asked a question: "If so many people live in areas like California that are inundated with earthquakes, how do they build houses that will not be destroyed by them?" (Yes, Judy wrote in an email, Jacob most likely did use the word "inundated.")

What does she do? Home building is not one of her objectives, nor one of the essential questions. But it is certainly related to the effects of plate movements. Judy decided to spend time with her students answering Jacob's question. She helped them build models of homes they thought could withstand a quake.

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Students built their models and then subjected them to what she called the "shaker tables," a tray that simulated an earthquake. They discovered that their homes would not survive, so they went back to the drawing boards and constructed newer, better-reinforced model homes.

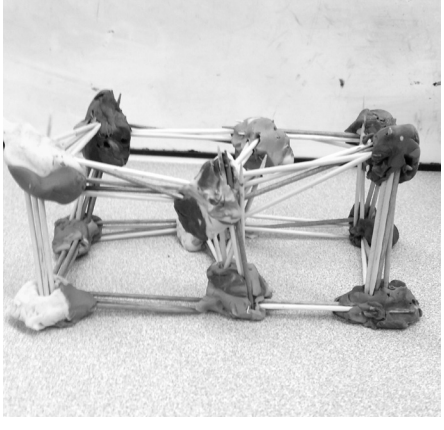

Photo courtesy of Judy Frohman.

Second reinforced model home

What did students learn from this most engaging experience?

> " . . . that if people don't make strong buildings it wouldn't be safe for anyone that is living in it and that there is no way to prevent an earthquake . . . "

" . . . make the building and test it to see if you did something wrong . . . "

" . . . if there is a real seareese [*sic*] earthquake you could try to go in your bathtub or basement . . . "

Why did Judy decide to spend so much time on Jacob's question?

Judy told me, "Children learn best when they take an active role in the learning process. When a teacher uses the children's own questions to design lessons, she often finds that the direct result of this is an increase in student enthusiasm to learn the concepts being presented, and an increased mastery of these same concepts."

"Children learn best when they take an active role in the learning process. When a teacher uses the children's own questions to design lessons, she often finds an increase in student enthusiasm and an increased mastery." (Judy Frohman)

As a follow-up to such an engaging, interactive learning experience Judy asked her second graders what new questions they had:

Samantha: "Are there different kinds of earthquakes?"

Zachary: "Can they tell how far down in the Earth the earthquake started? Since we learned about faults in the Earth, and how many earthquakes happen there, how deep are these faults?" (Consider the reasoning here! Searching for connections among faults, quakes, and depth of each. Who says second graders don't think abstractly?)

Mike: "How long do most earthquakes last?"

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It's important to round out our investigations with students' reflection on what was meaningful about what they have learned and what new wonderings they have. See Figure 3.3.

Often we will learn from students' reflections just what was important to them. For example, I asked Judy to pose this question to her students: "Why do you remember what we learned in science more than other subjects?"

Daniel: "It is the most interesting to us."

Jacob: "The experiments are so fun they just keep popping back in our minds." (Why do you suppose?)

Zachary: "We do crazy things and it is exciting."

Darcy: "I do the experiments again at home with my sister and family if I can get all the stuff I need to do it."

Arielle: "It is my favorite subject."

Designing, testing, and rebuilding their earthquake-proof homes illustrate what Piaget is supposed to have said about learning—a process of "acting upon" content. That is, students have worked at Levels II and III of the Three-Story Intellect:

1. Imagine a situation
2. Hypothesize and construct a model
3. Test it out
4. Evaluate results (compare expectations with reality)
5. Redesign, retest, and evaluate the model

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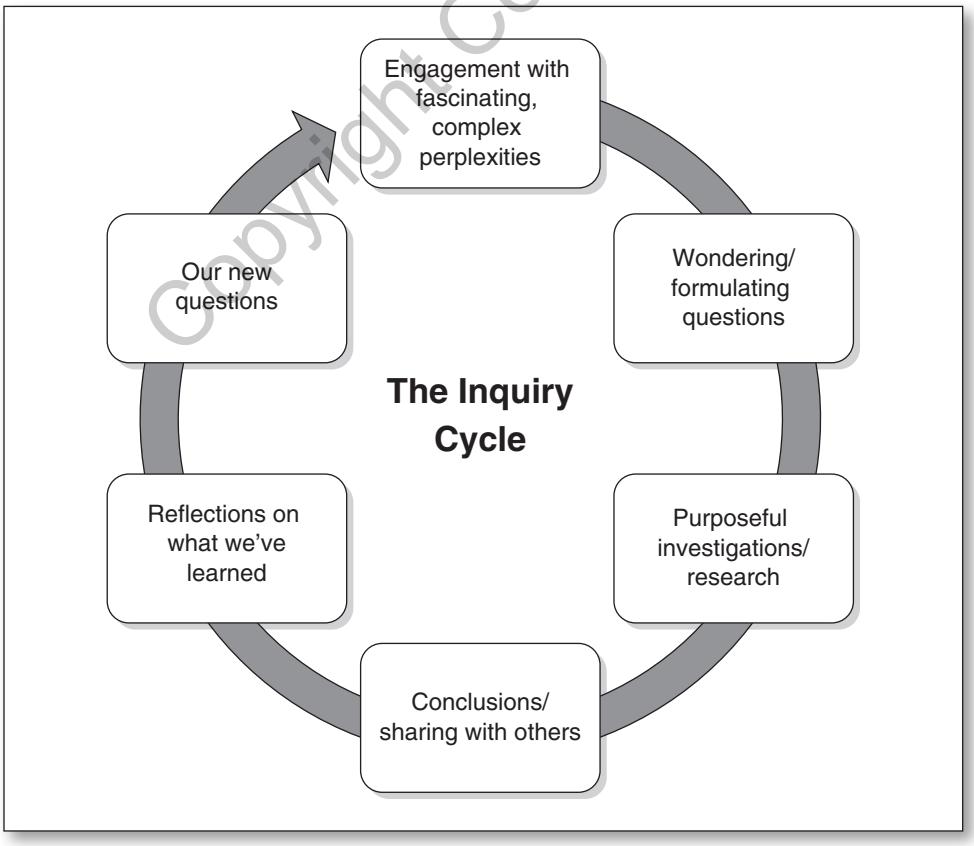
Figure 3.3 The Inquiry Cycle



Here is a master teacher in her element, one who feels comfortable with encouraging students to follow their own wonderings, to provide them with resources so they can ask a serious question about nature. When we have opportunities like this one, to share control with our students, we can seize upon them to enhance the learning experience.

What we also see in Judy Frohman's experiences with earthquakes and students' questions are the hints of a curricular framework to be explored more fully in the next chapter:

- **Initiating experiences**—Any artifact or situation introduced at the beginning of a unit to foster interest and inquiry, such as pictures, videos, and displays of Earth processes, including plate tectonics and earthquakes.
- **Core learning experiences**—Where we are learning the major concepts of the unit. Judy modified her core to include Jacob's question about earthquake survival.
- **Summative experiences**—Where we culminate an inquiry unit with projects, assessments of students' understandings, and reflections like those above.

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CONCLUSION

We can do a great deal to create an environment that invites students to be curious, to share their wild fascinations, and to persistently press for answers:

- Model our own curiosities
- Play wonder games like **Magic Bag**
- Introduce students to the Three-Story Intellect to help them discern important differences among all their questions.
- Use events—like birds at the window bird feeders or earthquakes—to start long-term inquiry.
- Reverse Show and Tell to become an inquiry activity for students.
- Find opportunities in popular stories to invite students to identify a major character's problem and ask them, "How would you solve it?" Consider all possibilities, then allow students to select the one that best solves the problem for them.
- Be prepared to use questions—like Jacob's question about surviving earthquakes—to launch experiments, testing, and examining results.

We need to give students times when they can engage in "wonder talk" about objects we bring in and about characters in stories. During

such informal gatherings, we will all ask questions and we might find answers to some, but our primary aim is to become comfortable with each other's wonderings and speculations.

And we should establish the kinds of routines where students listen to and respond to each other. I am often in workshops with adults where they see me waving toward the group, because a teacher is answering a question, responding to something another person said and talking only to me! I'm motioning for them to tell the whole group. "Don't tell me, the teacher, tell your colleagues. I'm not the only person here. Respond to each other." It baffles them at first, but then they get the idea: We ought not to respond only or primarily to the teacher, but to each other. I learned this from Matt Lipman and his Philosophy for Children program, an excellent way to challenge students to ask good questions and investigate:

"I agree with Dorothy, because . . . "

"I disagree with Andrew and want to add something . . . "

"I agree with everybody but think it's important to notice . . . "

If we wish inquiry to flourish, we all need to be actively listening and responding to each other.

Inquiry thrives in such interactive settings.

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PRACTICAL OPPORTUNITIES

1. Start writing your own Inquiry Journal wherein you reflect on what surprises, amazes, and fascinates you. Learn about the kinds of questions you do and do not ask.
2. Share with students your writings, your objects of fascination, to invite their own questions. Bring in an object, picture, or experience and think aloud in front of students, just sharing your observations, your related thoughts, and some curiosities. Eventually, we will feel comfortable doing this spontaneously.
3. Invite students from other grades to model good interactive, small-group behavior. Or bring in a group to model negative group behaviors and have your students identify what they are not doing well.
4. Create classroom meetings wherein you ask students, "What do we have to do here in order to create a community wherein we all ask good questions and learn from each other?" Make students stakeholders in their own successes. Post expectations around the room.

5. Find objects at home, at school, and in the surrounding environment that might spark students' wonderings as Phyllis Whitin's birdfeeder did, or objects for the day like seashells, rocks, newspaper articles, works of art, and the like. Find objects as did Judy Frohman within your unit that might lead to Observe, Think, and Question.
6. Through modeling your own writing processes, encourage students to write in their own Inquiry Journals. For those who do not yet write, we can help them draw pictures of their objects and curiosities. Post these also.
7. Create your own Wonder Wall. Here you and students will place current questions about stuff we're learning. Using sticky notes is easy. We might deal with them immediately or later, but attend to them we must. They might, of course, provide students with encouragement to search for answers on their own. See Glossary.
8. Involve parents in students' wonderings with letters or memos sent home describing the importance of observing, thinking, and wondering.

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