The Power of Questioning
Guiding Student Investigations

Julie V. McGough and Lisa M. Nyberg

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The Power of Questioning: Guiding Student Investigations

Why Is Questioning a Powerful Teaching Tool?

Julie V. McGough and Lisa M. Nyberg

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Dedicated to all teachers who inspire children with minds full of wonder to seek answers to a lifetime of questions.
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Library of Congress Cataloging-in-Publication Data
McGough, Julie V., 1969-
The power of questioning : guiding student investigations / by Julie V. McGough and Lisa M. Nyberg.
pages cm
Includes bibliographical references.
LB1585.M375 2014
S07.1--dc23
2015001191

Cataloging-in-Publication Data for the e-book are available from the Library of Congress.
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Color Coding

Throughout *The Power of Questioning*, the text, illustrations, and graphics are color-coded to indicate the components of the instructional model.

**Questioning** is printed in **red**.

**Investigations** are printed in **blue**.

**Assessments** are printed in **purple**.

When thoughtful **questioning** is combined with engaging **investigations**, amazing **assessments** are produced—just as when **red** and **blue** are combined, **purple** is produced.

We’ve also provided links and QR codes to the NSTA Extras page where you can view videos related to content throughout the book. Visit [www.nsta.org/publications/press/extras/questioning.aspx](http://www.nsta.org/publications/press/extras/questioning.aspx) to view all supplementary content.

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Learn from yesterday, live for today, hope for tomorrow.

*The important thing is not to stop questioning.*

**Albert Einstein**

*(Relativity: The Special and the General Theory, 1920)*
PART 3
How Do I Implement the Power of Questioning?
Engaging in Purposeful Discussion

How Do I Implement the Power of Questioning?

How Do I Implement the Power of Questioning?

Children wonder, think, and ask questions naturally! Sharing ideas with a partner or group helps students structure thoughts to communicate thinking and offers an opportunity for them to learn together. When you model metacognition and use a variety of questioning strategies, your students learn how to question effectively. Modeling helps children develop the skills to question their own ideas, question one another’s ideas, and build conceptual understanding. Purposeful questions launch, fuel, and propel the discussion so students use higher levels of thinking and analyze concepts.

I wonder … what ate a hole in this leaf?

Hmm … Do you see any teeth marks?

I think it was a snail because …

How Do I Use Questioning to Engage Students in Purposeful Discussions?

Questioning engages students and teachers in thinking about concepts and clarifying ideas. The process creates a dynamic purposeful discussion that recalls prior knowledge and identifies misconceptions. The teacher uncovers new information through questioning and launches the discussion to reveal new questions and investigations. Modeling metacognition of previous learning experiences helps students use the process of thinking about thinking, preparing them to apply similar strategies to new learning situations independently.

In the following model discussion, the teacher helps students recall how they learned about spiders before beginning their investigations about plants. Notice how the teacher guides students to think about ways to investigate the structure and function of a living thing before beginning the new topic.

The teacher fuels the discussion by asking, “How do we learn about something?”

Carson: We use a book.

Annabel: We research … but a better, better way to learn about stuff … you write questions … and then if you are learning about that and you want to learn about those questions of that thing then you just research those questions. So write down questions and research them!

Next, the teacher identifies key points and reinforces academic vocabulary in context by saying, “We can use books to find answers to questions. We can also use the internet to find answers. Those are called resources.” To continue the discourse, the teacher asks,

What does a metacognition discussion sound like when students are questioning about questions?

Scan the QR code or visit www.nsta.org/publications/press/extras/files/practices/questioning/video5.htm to listen to a discussion with different types of questions.
“What else do we look at, or work with, or explore that helps us to learn about things in our investigation station?”

Carter: I have a connection to my black widow … that umm … Zach told me he saw the red spot.

Teacher: Connections help us learn. Think about the question I am asking. We need to focus on this question.

Victor: Ummm … I have a connection.

Teacher: Hold on. … I want to know how we learn about something. When we learned about spiders and looked up answers, Carson said we used books to find information. What else do we do to help us learn about spiders, or turtles, or fish, or about other things? (Reinforcing discussion expectations)

In the previous dialogue, one student wanted to talk about a black widow, and another student wanted to make a connection. The teacher acknowledged making connections as a positive action but reminded the students that connections need to be relevant to the discussion. Although the metacognition involves a previous investigation of spiders, this discussion focuses on “how we learn.”

⇒ To reinforce the discussion expectation, the teacher restates the question to include more learning experiences than just spiders. “What else do we do to help us learn about spiders, or turtles, or fish, or different things?”

Deran: We used a microscope when we looked at a tarantula.

Teacher: So when you look in a microscope, what do you see? When you look through a microscope at something, you see things closer. When you see things closer, how does that help you learn about it? (Probing question)

Mia: That means you can see it better, and you kind of know what they have.

Teacher: Know what they have … What do you mean by “know what they have”? (Clarifying question)
Teacher modeling lays the foundation for students to use questioning during discussions to clarify meaning. In discussion about the parts of a plant, a student asks a clarifying question about the meaning of a word, offering the teacher an opportunity to integrate academic vocabulary and model how to work through the process of thinking about what a word means in context.

The teacher asks, “Do you think that parts of the plant have a purpose?”

Deran asks, “What do you mean by that? What is purpose?”

The teacher responds, “I love your question, Deran. Everyone, he is clarifying. That’s a big word, clarify. I said something that he didn’t understand, and he’s clarifying what it means because he’s learning to ask more questions to figure out what it is the teacher is trying to talk about.

“So, to clarify, Deran, does a leaf have a purpose? Why does the plant have leaves? Why does a plant have roots? Why does a plant have a stem? Why does the plant have those things? Do parts of a plant have a purpose?”

Deran responds, “Plants need leaves because of the air. They have a purpose with air.”

Victor adds, “Roots make it grow.”

The teacher props the discussion by asking, “How do roots make the plant grow?”

The discussion continues as students explore the purpose of different parts of a plant leading to investigations (Figures 3.1–3.3, pp. 53–55).
Part 3

How Do I Implement the Power of Questioning?

Figure 3.2. Launch … Fuel … Propel!
Launch, fuel, propel in action.

Launch
*“Plants are all around us. We even eat different parts of plants!”*
*“What do you know about plants?”*
- Questions introduce concepts and launch purposeful discussions.
- Questions invite students to communicate prior knowledge. Make note of student misconceptions.
- Questions inspire students to share their questions.

Fuel
*“Yesterday we talked about the parts of a plant.”*
*“What is the purpose for each part of the plant?”*
- Questions work as a catalyst to fuel the discussion. Focus the question on real objects or something tangible (e.g., celery stems in colored water).
- Questions fuel the discussion as you focus investigations and use resources.
- Questions involve students in developing new questions, collecting data, and recording observations.

Propel
*“Observe the inside of a bird of paradise stem, and notice the tubes. How does water move inside of a stem?”*
- Questions lead to further investigations. Investigate bird of paradise stems. Cut the stem open to see what is inside.
- Questions lead to performance assessments that help students communicate understanding. Research other parts of a plant and how they work. Build a model plant to explain the process.
- Questions lead to local and global connections. “How can students communicate their understanding?” Present the model plant to community members who helped design the school garden.

Figure 3.3. Discussion Template

<table>
<thead>
<tr>
<th>Launch</th>
<th>Fuel</th>
<th>Propel</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Plants are all around us. We even eat different parts of plants!”</td>
<td>“Yesterday we talked about the parts of a plant.”</td>
<td>“Observe the inside of a bird of paradise stem, and notice the tubes. How does water move inside of a stem?”</td>
</tr>
<tr>
<td>“What do you know about plants?”</td>
<td>“What is the purpose for each part of the plant?”</td>
<td>“How does water move inside of a stem?”</td>
</tr>
<tr>
<td>Questions introduce concepts and launch purposeful discussions. Questions invite students to communicate prior knowledge. Make note of student misconceptions. Questions inspire students to share their questions.</td>
<td>Questions work as a catalyst to fuel the discussion. Focus the question on real objects or something tangible (e.g., celery stems in colored water). Questions fuel the discussion as you focus investigations and use resources. Questions involve students in developing new questions, collecting data, and recording observations.</td>
<td>Questions lead to further investigations. Questions lead to performance assessments that help students communicate understanding. Questions lead to local and global connections. “How can students communicate their understanding?”</td>
</tr>
</tbody>
</table>

What will draw my students into the discussion?

What objects, investigations, or resources will help my students construct understanding and develop more questions?

Observations
Investigations
Resources

What types of questions do I need?

Convergent
Divergent
Clarifying
Probing
Justifying
Extending

How will I connect this discussion to the next discussion?

What opportunities may extend this unit to the community?
Discussion Management Tips

During investigations, classrooms are dynamic learning environments that may be noisy with a buzz of activity. Students and teachers interact, sharing discoveries and observations. During whole-class discussions, the dialogue may need to be more focused so all students have an opportunity to hear and be heard. Students listen, reflect, share, and build understanding. The teacher models discussion expectations and guides the questioning to support a respectful exchange of ideas.

How Do I Make Sure All Students Participate in the Discussion?

Some students may want to answer all the questions during every discussion. The teacher may say, “Tess, you always have great ideas and questions to share! We need to hear other people’s thoughts to make new connections. Hold on to your idea, and I will come back to you in a minute.”

- The teacher acknowledges the child’s ability to share great ideas but reinforces the value of learning together and making new connections. Making sure this child participates but does not dominate the conversation is important. This student may show unique characteristics that could fuel or propel the discussion if called on at just the right moment (see the Figure 2.2, pp. 36–37).

Students may be shouting out answers when other children are trying to answer or during wait time. The teacher may say, “Sam, your ideas are important. Abby’s ideas are important too. When you are talking, we can’t hear Abby’s ideas. We need to take turns listening to each other. It’s important for people to listen to you. It is also important for you to listen to other people. Abby, please continue.”

- The teacher acknowledges the importance of contributing ideas to the discussion and accepting contributions from others to maintain a fair and respectful learning environment. The discussion continues immediately by returning to the student who was interrupted, reinforcing the importance of focusing on the task at hand.

How Do I Address Disruptions During a Discussion?

Students may be off task during a discussion. The teacher may say, “Kara and Justin, I’m a little concerned about what I see because digging in your backpack is not helping you learn about plants. I need you focused on what we are doing, please.”

- The teacher addresses specific students and a specific behavior. Noting a concern for students not learning helps them remember why they need to focus.

Students may be getting restless toward the end of a discussion, but you need to continue. The teacher may say, “We are focusing on the plant and not on animals that interact with the plant today. All right, I am going to count to three and everybody is going to be in their space and ready to listen and learn. One … two … three. Aidan you were waiting very patiently. What do you want to say?”

- The teacher reminded students of the topic of discussion and prompted students to focus with specific expectations (in your space, ready to listen, and ready to learn). The discussion resumes immediately by acknowledging that a student was waiting for an opportunity to participate.

Sometimes discussions do not go as planned. The teacher must thoughtfully lead the group, with students sharing ideas and resources.

- The teacher sets up a collaborative learning environment and models a respectful exchange of ideas. If the discussion loses a constructive, collaborative focus, the teacher may need to stop the discussion, lesson, or activity. Time may be needed for the teacher to consider how to redirect the group with a more constructive focus or review the expectations for discussions and sharing resources.
How Does Questioning Create Opportunities That Lead to Deeper Investigations and Authentic Assessments?

Children learn naturally through questioning, wondering why and how. *The Power of Questioning* prepares children to question more effectively and investigate more thoughtfully. Children build skills to prepare for their next discovery, investigation, and real-world learning opportunity. Dynamic investigations provide a real-world context and a catalyst to engage and expand the child’s world!

What do owls eat? How can I learn more about owls? What could I make to show what I learn?

Hmmm ...

How can I teach skills and concepts through a study of owls and birds of prey? What resources do I need to plan investigations? How will my students communicate their understanding of the concepts and skills?
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This pedagogical picture book invites you to nurture the potential for learning that comes from children’s irrepressible urges to ask questions. Part of NSTA’s Powerful Practices series for elementary educators, The Power of Questioning offers you:

- a solid foundation in both theory and practice. The book’s three-part instructional model is grounded in questioning, investigation, and assessment. Both you and your students will learn how to question effectively, making investigations more engaging.

- an unusual opportunity to see a model brought to life. The authors provide vivid pictures as well as links to special videos and audio recordings. You can actually hear teachers and students engage in questioning and watch two easy-to-adapt examples (involving plants and life cycles) of the model in action. Then, you can implement the new strategies right away in your own classroom.

- standards- and STEM-friendly benefits. The book also illustrates how to integrate state standards, the Next Generation Science Standards, the Common Core State Standards, and STEM education practices.

The Power of Questioning is a fresh, lively source of strategies both you and your students will enjoy. The authors are veteran educators who know how busy and demanding today’s K–6 classroom is. This easy-to-use volume is proof that sometimes a powerful tool comes in a small package.