Powerful Practices Series





Lisa M. Nyberg and Julie V. McGough



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-Carol Ann Tomlinson

Dedicated to all learners who seek answers and love learning!



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Cataloging-in-Publication data for this book and the e-book are available from the Library of Congress. ISBN: 978-1-68140-549-0 e-ISBN: 978-1-68140-550-6

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#### **Color Coding**

Throughout *The Power of Assessing*, 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/assessing* to access all supplementary content.

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#### The Powerful Practices Series

The Power of Assessing is the third book in the NSTA Press Powerful Practices series and focuses on modeling authentic assessment techniques. The series also includes *The Power of Investigating* (2017) and *The Power of Questioning* (2015), which was selected by educators and publishers of the Association of American Publishers as a REVERE award finalist.

## **PART 3** How Does Metacognition Support Instructional Decision Making?



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#### **Building a Cognitive Environment**

Metacognition engages students and teachers in reflection of the learning process in essence, thinking about thinking. Metacognitive questions give teachers a better understanding of how students are processing content, the types of connections they are making, and how they are constructing knowledge. This insight provides a valuable tool when planning learning experiences to help children contend with big ideas. Metacognitive questions may include the following (see also Figure 3.1):

- How can you find the answer to your question?
- What steps do you need to take to help your group complete your project today?
- What other resources do you think you may need?
- How does your idea connect to the topic?

Modeling questioning and reflection throughout learning fuels active involvement in the assessment process, helping students see how to think out loud and internalize the language of questioning. Students need opportunities to learn from mistakes, persevere when learning is challenging, and think about content from different perspectives. Thinking out loud in the context of learning experiences helps students practice this valuable skill as they become independent learners.

Reflecting on learning experiences helps teachers communicate active questioning strategies and encourages students to use the same strategies as they reflect on their work. Ongoing authentic projects provide opportunities for students to reflect on learning and see progress over time. Making connections across the curriculum engages learners in various disciplines, applies knowledge and skills to complete authentic tasks, increases the complexity of thinking, and deepens understanding. Metacognitive questions support students and teachers as they wonder and learn together.

#### Figure 3.1. Student Metacognition



#### **Student Metacognition**

- How am I going to find out what I want to know? (researching, reading, writing, collaborating, building)
- What questions do I need to ask to figure this out? (clarifying, justifying)
- What can I do to help myself understand? (discussion, observation, work product)
- What learning goals am I trying to accomplish? (academic, social, performance expectation)
- How will I communicate or show what I am thinking? (drawing, writing, demonstration, presentation, discussion)

#### Metacognition: Evidence-Based Decision-Making

Scan the QR code or visit: http://static.nsta.org/extras/practices/ assessing/video5.htm.



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#### How Do I Use Metacognition to Make Instructional Decisions?

Reflecting on assessment opportunities throughout a learning sequence illustrates the connected nature of the learning process. Figures 3.2–3.12 and Tables 3.1 and 3.2 on the following pages provide a step- by-step annotation of both the collaborative turtle writing project and the model animal project. The teacher reflection boxes offer insight into the teacher's perspective on various learning experiences.

#### Figure 3.2. Teacher Metacognition



#### **Teacher Metacognition**

- What are students doing? (researching, reading, writing, collaborating, building)
- What questions are the students and I asking? (clarifying, justifying)
- How am I assessing? (discussion, observation, work product)
- How are the students self-assessing?
- What learning goals relate to the activity or investigation? (academic, social, performance expectation)
- What questions, investigations, or lessons are needed to scaffold learning to reach the learning goals?

## How Do I Reflect on Assessment During a Collaborative Writing Project?

What are students doing?	What questions am I asking?	How am I assessing?	What learning criteria relate to the activity or investigation?	What questions, investigations, or lessons are needed for scaffolding?
Investigating the topic	How do sea turtles grow and change?	Clarifying and justifying questions	Using resources, collaborating with others, gathering information, asking questions	Sea turtle resources, guiding questions
Reading and research	What facts can you find in the text about sea turtles?	Observation: How are students accessing text and text features?	Reading complex informational text Supporting ideas with evidence from text and resources	Close-reading lessons Shared reading to model finding evidence
Sharing and sorting ideas	Why do some ideas go together?	Observation: How are students organizing ideas?	Communicating clearly, organizing information logically, and asking relevant questions	Shared writing to model sorting and organizing ideas
Collaborating and writing	How did we put the ideas together?	Is the writing in a logical order? How do students reflect on the process?	Reflecting on work by: Clearly communicating facts in a logical order. Explaining the process with accurate details.	Small-group lessons to explain details and organize ideas

#### Table 3.1. Metacognition at a Glance: Collaborative Writing

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#### Figure 3.3. Launch the Topic



**Launch the Topic**: Begin the unit by sharing a short video of sea turtles entering the ocean after hatching. Ask students, what do you know about sea turtles?

- Preassess: What do students already know about sea turtles and other ocean animals?
- Preassess: What are student questions about sea turtles?

**Teacher Reflection:** A short video engages students and helps me share part of my summer vacation. The story of seeing Kemp's ridley sea turtles hatching one morning while I was walking on the beach sparks the beginning of a unit of study about the ocean and the many animals that live there. Sharing information about the organization that helps protect the nests provides a purpose for learning more. This helps me assess students' interest in the topic and their prior knowledge.



#### Figure 3.4. Reading and Research

**Reading and Research:** Gather books about sea turtles and distribute them to students. Give students time to read and look at the books. Ask students to write down two or three facts about sea turtles on a piece of paper.

**Formative:** Are students using text features to find information? Are students using pictures? How do students document evidence to support a fact or idea?

**Teacher Reflection:** This is an opportunity to walk around the room and interact with individual students and small groups to observe how they are interacting with informational text. Listening to students read, collaborate, and ask questions helps me think about additional resources that may be needed to answer student questions or plan investigations. Knowing that I am using the sea turtle inquiry as a way to model the process, I make notes of resources I may need when students begin to learn about other ocean animals in small groups.



#### Figure 3.5. Sharing and Sorting Ideas



**Sharing and Sorting Ideas:** Students bring the facts they wrote down to the group area to share. Ask someone to share a fact and place it on the floor. Continue allowing different students to share. What happens when facts are similar? How do students begin to make groups of facts?

**Formative**: Do students group facts in logical categories (e.g., life cycle, characteristics, diet, types)?

**Preassess:** Do students realize that facts within a group need to be in a logical order?

**Teacher Reflection:** This inquiry-based writing lesson helps students discover that facts and ideas can be grouped together. Engaging students in the process of writing provides scaffolding to help them become independent in other writing tasks. Collaborative writing provides a model for students to reference as they continue to write about other topics throughout the year. They will remember the experience because the level of engagement was high and the topic of sea turtles was meaningful.



#### Figure 3.6. Collaborative Writing

**Collaborative Writing:** Type or write the groups of facts that students organized (to make them easy to read and manipulate). Cut the facts apart and pass them out to members of the group. Have students read the facts out loud. Ask, are the facts in order? Should one fact come before another? Why or why not? Continue until the group agrees on a logical order for this section of text.

Formative: Do students want to add facts or details to clarify information?

**Teacher Reflection:** When students read the facts out loud they are actively involved in determining how the information should be organized in order for it to make sense. This process engages students in a purposeful reading and rereading of the text in order to revise and edit. After each section of text is organized, I type it to read through with the class and make final adjustments. Reflecting on the process helps students think through the steps and understand why each part is important. Metacognition is an important part of learning. This practice helps me see how students are thinking and shows that I value their opinions. Thinking out loud together helps all students learn along the way. Students learn to reflect on their own learning when working independently.



#### How Do I Reflect on Assessment as Students Engineer Models?

#### Table 3.2. Metacognition at a Glance: Engineering a Model

What are students doing?	What questions am I asking?	How am I assessing?	What learning criteria relate to the activity or investigation?	What questions, investigations, or lessons are needed for scaffolding?
Working as a team	How will we work together in small groups?	What are student's ideas about teamwork?	Communicate, collaborate, and solve problems effectively	Small-group games, discussions, and teamwork activities
Research and reading	What are the parts of the animal? How can we find out?	How are students accessing text and using resources to find information?	Organize information, gather ideas, and use evidence from text and resources	Guided research lessons; model finding evidence from resources
Designing and planning the model	What materials should we use?	How do students describe the structure of the animal?	Make a logical plan and list of resources relevant to the model	Guided small-group discussions and planning experiences
Building models	How will we build a model of this animal?	How do students solve problems while building the model?	Use key concepts and science vocabulary; ask relevant questions	Guided small- group work to design, build, and problem solve
Documenting and presenting	How will students communicate understanding?	How does the model help students articulate important information?	Clearly represent and communicate the structure and function of an ocean animal	Reflect and discuss as a small group. Use clarifying and justifying questions to help students explain concepts

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Animal: What do we Know?	• Help rach other • Do not be bassy • Explain 1 Cliently • Work quietly • Don't fight
Questions: Design: (Supplies:	Cant upbetone Trust each after Encourage each after or documant Persevere Kop trying turt giv us! Mistakes are OK! You an turn from turc

#### Figure 3.7. Teamwork Discussion

**Teamwork Discussion:** Begin the small-group work by setting the stage for successful teamwork. Ask students, "How can we work together as a team to accomplish goals? What do members of your team need to do?"

Preassess: What do students know about working together?

**Teacher Reflection:** Engaging students in a discussion about teamwork helps establish guidelines to accomplish goals. The teamwork discussion gave me great insight into how students think about taking turns and making mistakes. I asked if it was okay to argue with your teammates. Students were divided in their responses, but one student helped us understand how sometimes arguing can make your ideas stronger. This also led to a discussion about being open-minded and listening.



#### Figure 3.8. Research and Reading



**Research and Reading:** Gather books and digital resources about ocean animals and distribute them to small groups. Give students time to read and look at the resources. Ask students to record important information about the structure and function of their group's animal. They can also include diagrams and drawings to begin planning for the model animal.

**Formative:** Are students using text features to find information? Are students using pictures? How do students document evidence to support a fact or idea?

**Teacher Reflection:** Interacting with each small group helps me assess individual students and their needs as they work with complex text. I can provide guidance as needed or make a note to work with a student individually to reread text or reinforce skills.

*Note:* The formative questions are the same as during the collaborative sea turtle writing exercise. Students should be progressing in their ability to find and use informational text as they progress through the learning experiences.



#### Figure 3.9. Design and Plan the Model

**Design and Plan the Model:** Students bring the information they have recorded and any drawings of their animal. The teacher meets with each group to discuss what they have learned about the structure and function of their animal. Bring a container of recycled materials and objects to brainstorm possibilities of what to use when building the model animal.

**Formative:** How do students describe the structure of the animal? Are students missing important information that may be helpful when building their model? Are students making connections between the objects and the shape and structure of the animal?

**Teacher Reflection:** This small-group discussion is a great way to see how students are thinking about the structure and function of an ocean animal. Using objects and materials adds a tangible component as children describe, demonstrate, and explain how the animals move, eat, defend themselves, and hide. The objects also help students transition from a two-dimensional representation (photograph) to a three-dimensional representation (their model). Children show excitement in anticipation of the next step of building the model animal. The students and I make a list of any other materials that we may have at home that could be used.

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#### Figure 3.10. Model Building



**Model Building:** Students work together with the materials and their notes to build a model of their ocean animal.

- Formative: How do the students organize their learning to construct a threedimensional model?
- **Formative:** How are students showing understanding of the structure and function of the animal as they build the model?
- Formative: How do students solve problems while building the model?

**Teacher Reflection:** Interacting with small groups gives me the opportunity to assess individual student understanding of key concepts during the "mess" of learning. Students use science vocabulary as they collaborate with their team and build the model. This is a very dynamic and exciting part of the learning, offering students an opportunity to construct understanding in a meaningful way.



#### Figure 3.11. Digital Documentation

**Digital Documentation:** Each group will create a digital representation of their learning. The document will include a diagram of their finished model labeling the parts of the animal and explaining what they used for each part. It will also include photographs of the real animal and information about where the animal lives and how it survives in the ocean.

**Metacognitive:** How do students explain their thinking? How does building the model help students articulate important information?

**Formative:** How do students understand the structure and function of their ocean animal?

**Teacher Reflection:** Reflecting on the process helps students think through the steps and understand why each part is important. Metacognition is an important part of learning. This practice helps me see how students are thinking and shows value for the opinions of others. Thinking out loud together helps all students learn along the way. Students learn to reflect on their own learning when working independently.

This step also helps me see how students are processing important information as they initially reflect on the experience and complete their final product.

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#### Figure 3.12. Presentation



**Presentation:** Each group will present their model animal and the digital representation of their learning.

• **Summative:** Do students present their information completely? Are students able to answer questions from other groups, effectively articulating the information learned?

**Teacher Reflection:** The presentation phase of this project is a celebration of the entire process. Students articulate information they learned as they recount their experiences (research, planning, building, designing, etc.). Children are proud and excited to share this meaningful experience!

Reflect as a whole group on the process and experiences. How do students recount experiences? What were the struggles? What parts of the process did students find most rewarding?

The reflection as a whole group allows students to comment on group dynamics and offer suggestions for future learning experiences. This helps me plan to repeat aspects that went well and reevaluate aspects that were challenging. How can I improve on the experiences to offer better support or to deepen learning?



Assessments can be dynamic tools of learning. Assessments can be fun! Powerful questioning and investigating practices will lead you down a rich instructional path. When thinking of assessments some people refer to the quote, "I suppose it is tempting, if the only tool you have is a hammer, to treat everything as if it were a nail." Teachers have so many tools in their toolbox! Teachers are creative! Teachers are resourceful! Imaginative and innovative assessment design will energize your students and provide rich data to help you make instructional decisions. Your powerful instructional practices will change the lives of your students. How will you design new learning adventures to empower and inspire the children of today who will build our tomorrows?

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*"The Powerful Practices* series is an ideal bridge between theory and practice. Teachers love the user-friendly resources, which encourage their students to ask questions and suggest ways to make learning applicable to the real world. The authors provide the support teachers need to appropriately use the *NGSS* with students of all ages. These books are 'must have' resources."

-Nan Barker, Regional Director, CalStateTEACH, California State University, Fresno

*The Power of Assessing* invites you to explore the use of authentic assessments as a dynamic teaching tool to provide thoughtfully designed learning experiences for your students. Through rich description, colorful photographs, and **over 30 minutes of video footage** you can actually see and hear teachers and students in action as they use preassessments and formative and summative assessments. See how teachers use metacognition as a powerful strategy to make evidence-based instructional decisions and help students navigate their own learning.

Like a tutorial between two covers, the book provides:

- Vivid pictures, videos, and audio recordings that let you see and hear teachers and elementary students engage in assessments as part of standards-based learning. It offers memorable ways to see how authentic assessments make the learning accessible.
- **Detailed examples** of preassessments and formative, summative, and metacognitive assessments, plus assessment management tips.
- $\frac{2}{2}$  **Practical advice** on building an assessment plan with a backward-mapping guide.
- **Rich assessment** possibilities for designing engaging, accessible assessments for all learners by applying elements of universal design for learning and multiple intelligences.
- **Sound guidance** on how to use metacognition to make evidence-based decisions about instruction and design purposeful learning adventures.

As the third book in NSTA's *Powerful Practices* pedagogical picture book series, *The Power* of *Assessing* builds on the strategies modeled in *The Power of Investigating* and *The Power of Questioning*. The authors are veteran educators who know how busy and demanding today's K–5 classroom is. As powerful tools in small packages, all of these books provide engaging, dynamic strategies you and your students will learn from and enjoy.



#### PB358X3 ISBN: 978-1-68140-549-0

