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Instruction That Sticks

The Right Questions

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One simple shift can help our students become better thinkers and problem-solvers.

Julie Grimm, a teacher at Salem Avenue Elementary School in Hagerstown, Maryland, was concerned that many of her 2nd grade students failed to become engaged in their research projects. She found herself spending lots of time trying to provide the right research framework for all students while guiding struggling students through the process.

Then Julie made one simple shift that disrupted her typical classroom practice and led to a more dynamic learning environment. She began to teach her students how to ask their own questions.

The Power of Question Formulation

We first became interested in the potential of questions two decades ago, when we heard from parents in a low-income community in Massachusetts that they were not participating in their children's education because they "didn't even know what to ask." This insight—that the inability to formulate questions can be a significant obstacle to effective participation—has guided our work ever since. We have researched, developed, and tested methods for teaching the skill of question formulation in the simplest way possible to a wide range of audiences, including residents in homeless shelters, patients in community health centers, participants in adult literacy classes, and Harvard University graduate students.

These years of research and refinement led to a protocol—the Question Formulation Technique—that makes it possible for anyone, no matter their level of income or education, to learn how to produce and improve their own questions and then strategize on how to use them.

The Question Formulation Technique includes the following steps:

1. Design a question focus.
2. Produce questions.
3. Work with closed-ended and open-ended questions.
4. Prioritize questions.
5. Plan next steps.
6. Reflect.

Rigorous research on this strategy has been carried out in a range of settings outside the classroom. A National Institutes of Health (NIH) randomized control trial, for example, showed dramatic increases in patients' ability to participate in their health care and partner more productively with professionals when they used the Question Formulation Technique to ask better

questions (Alegría et al., 2008). The NIH study and other research published in medical journals demonstrated that it is possible to deliberately teach the skill of question formulation to all people (Deen, Lu, Rothstein, Santana, & Gold, 2011).

Would the same simple protocol work in the classroom? Could teachers easily adapt it to teach the skill of question formulation to students? Initial research on use of the Question Formulation Technique in a classroom environment has shown that "the development of these questioning skills and behaviors empowers the learners to conceptualize and express their thinking without having to depend primarily on teacher questioning to provoke or promote their natural curiosities" (Elves, 2013, p. 2). And teachers who have used the technique in primary, middle, and high school classrooms across all subject areas in a wide range of communities have reported newly energized students who are excited by learning to ask their own questions.

Question Formulation in Action

Julie Grimm had an ambitious agenda for her 2nd grade students as she was about to plunge into her science curriculum on "weather concepts." She knew the content she was required to cover: information about different kinds of weather events (tornadoes, hurricanes, and floods, for example). She also wanted her students to develop specific research skills (including obtaining and accessing information, evaluating the usefulness of resources, and planning collaboratively) as well as better reading, writing, and thinking abilities.

In the past, when she assigned research projects to help students develop those skills, many students struggled or even disengaged from the process. She began to use the Question Formulation Technique at various points in her instruction. The following example demonstrates how, in one 45-minute lesson, she deployed the technique at the beginning of her weather unit to help students develop divergent, convergent, and metacognitive thinking abilities.

Step 1. The teacher designs a question focus.

Julie was accustomed to creating research prompts that were questions *from* her *to* the students. She typically spent a lot of time and effort figuring out the best questions to get students off to a good start.

The first shift she had to make in using the Question Formulation Technique, one that can at first feel awkward for both teacher and student, required presenting students with a focus for them to generate their *own* questions. Because she knew that students would differ in their prior knowledge, Julie decided to use a barebones question focus—just the names of the weather events she wanted students to learn about. She was not sure what her students would do with these terms, but she was curious to see what questions they would ask as they began their study.

Step 2. Students produce questions.

Julie posted the Question Formulation Technique's four rules for producing questions:

1. Ask as many questions as you can.
2. Do not stop to judge, discuss, edit, or answer any question.
3. Write down every question exactly as it was asked.
4. Change any statements into questions.

She asked students to discuss what might be difficult about following these rules. As the students reflected on their usual way of working with questions, they said things like, "When I hear a question, I want to answer it right away," and "It's hard to write down the question just the way it comes out." This discussion about the rules heightened the students' awareness that they were about to do something different from what they had done before.

Julie split the students into small groups of three or four according to their interest in specific weather events. She then had them write their question focus at the top of their big sheet of newsprint (*Hurricane* or *Tornado*, for example) and gave them this simple instruction: "You have five minutes to ask questions. Make sure that you follow the rules. No discussion—just questions." Here are the initial questions produced by one group of students, whose focus was hurricanes:

1. Are hurricanes different from tornadoes?
2. Where do hurricanes start?
3. What do hurricanes do?
4. Why does a hurricane have an eye?
5. How do hurricanes start?
6. Why are hurricanes made of water and air?
7. Why do hurricanes have strong winds?
8. Are hurricanes in certain places?
9. What is the eye of a hurricane?
10. What makes hurricanes so dangerous?

Some groups moved more quickly than others. Some came to a pause after they had asked four or five questions. When Julie observed students slowing down, she prompted, "Try to think of more things you want to know." She refrained from passing judgment at this point on questions that she did not deem good research questions.

In this first use of the Question Formulation Technique, some students tried to pull her in, saying, "Can you give us examples of what kind of questions you want?" or asking what she thought about their questions. But from the outset, Julie intentionally stayed to the side of the process as a neutral facilitator. The goal in this initial step was to get students to do what she had rarely seen them do before: generate their own questions, generate lots of questions, and do it without help from the teacher.

Step 3. Students work with open-ended and closed-ended questions.

After students created their initial list of questions, Julie presented a simple explanation of the difference between closed-ended questions (those that can be answered with a yes or no) and open-ended questions (those that need more explanation). She then asked students to reflect on the advantages and disadvantages of both kinds of questions. This offered them an opportunity to discover how the way a question is asked can shape the kind of information that follows.

For example, students of all ages often say that closed-ended questions produce clear, quick answers and "then you know something and can move on quickly to something else." But they also realize that closed-ended questions might limit how much information they get. Similarly, they see that open-ended questions might yield more information and lead to further discussion, but the answer might be more than they can understand or may lead them off-track.

During this step, students also practice changing questions from closed to open and from open to closed. This task can be challenging for students and adults of any age. Julie wanted her students to get the best start on their research, so it was important to change some of their closed-ended questions to open-ended ones. For example, the students changed "Are hurricanes different from tornadoes" to "Why are hurricanes different from tornadoes?"

It is also valuable, however, to practice the reverse. For example, Julie's students went from "How do hurricanes start?" to a closed-ended version, "Do hurricanes start the same way every time?" The closed question was not necessarily better or worse than the open one, but as a strategy for doing research, it helped students think concretely about patterns and characteristics of a hurricane. Students can often use closed-ended questions as a way to unpack and get closer to an answer to a broader question.

In this step, the students were not yet working on choosing the final questions to guide their research projects. Julie was not judging their questions or telling them which ones they should be asking. Instead, she was helping them learn how to examine questions from different angles to figure out which ones would be the best research questions.

This is the kind of intellectual heavy lifting that scholars in any field must do. Stuart Firestein (2012), chair of the biology department at Columbia University, argues that a successful questioning strategy for young scientists "is one that provides them even a glimpse of what's on the other side of their ignorance and an opportunity to see if they can't get the question to be bigger" (p. 107). In the Question Formulation Technique, it's elementary, middle, and high school students who are doing that kind of high-level thinking.

Step 4. Students prioritize questions.

Because the teacher is aware of what the students will be using their questions for, he or she gives them specific instructions about prioritization. For example, if students are generating questions to do an experiment, the teacher may tell them, "Choose three testable questions" (which will be closed-ended).

In Julie's case, in which the purpose was to create questions for further research, the instructions were simply "Choose three open-ended questions you want to use in your research." By providing some parameters, yet avoiding being overly prescriptive, Julie gave students room to think about which questions would be most interesting and productive to explore.

Julie's students were becoming more sophisticated in their ability to discern which questions needed to be answered and when. As they looked closely at their list trying to choose their priority questions, they quickly concluded that they could not address Question 1 (Are hurricanes different from tornadoes?) until they worked on Question 3 (What do hurricanes do?). They also saw that there was a connection between Question 4 (Why does a hurricane have an eye?) and Question 9 (What is the eye of a hurricane?). They became curious about the eye, having thought about it from different angles, and they decided to make it a top question.

As they discussed the questions further, they also realized that rather than using Question 1, "Are hurricanes different from tornadoes?" they preferred the version they had created when they were practicing changing from closed-ended to open-ended questions, "Why are hurricanes different from tornadoes?" These students, who had never asked more than a couple of questions at a time, now realized that they were capable of producing lots of questions and refining their questions as they went deeper into the analytic process. In this case, they chose as their three priority questions:

- What do hurricanes do?
- What is the eye of a hurricane?

- Why are hurricanes different from tornadoes?

Step 5. Teacher and students discuss next steps for using the questions.

Once students had chosen their top three questions, Julie told them that they would use their research to write books, create models, and make posters.

Step 6. Students reflect.

The students by now had produced their own questions, analyzed their list, categorized the questions, changed questions from open to closed and closed to open, prioritized the questions, and discussed how they would be using their questions. They had done a lot of thinking and work in about 45 minutes.

Julie completed the process by creating an opportunity for students to reflect. She asked the whole class just two simple questions: "What did you learn?" and "How did you learn that?"

This last metacognitive exercise is an important part of the Question Formulation Technique. The students look at the evolution and development of their questions and see how they arrived at their priority questions. One student talked about how "we learned a lot about hurricanes just by asking questions. I heard questions that I never would have come up with." Another student described how "I didn't know that you could change a question, and then you find out a lot more with your new question." Another said, "It was hard. You had to think a lot, but it was fun!"

A Catalyst for Deeper Learning

Julie Grimm's 2nd graders asked fundamental research questions about mechanics, causes, consequences, variations, protection, responses, and impact on life and safety of various weather events. They owned their questions and therefore owned the research process. It was a radically different experience than it would have been if they had been sent off to do research based on questions Julie had given them (even though her questions may have overlapped with some of theirs).

In the Question Formulation Technique, students sometimes discover, much like scientists in a laboratory or researchers in any field, that as they conduct their research they come up with new questions they want to explore. In the case of hurricanes, as students researched their initial questions, they became more and more curious about specific details. For example, as they became aware of the power and danger that hurricanes present, they wanted to know more about the people who put themselves in harm's way when studying hurricanes. They asked, perhaps with the Weather Channel in mind, "Why do people chase hurricanes?"

Julie noted that her students worked as true researchers and authors. She commented, "I used to laugh at getting students 'college ready' in 2nd grade, but now I think they are really building a lot of those skills—questioning, note taking, choosing text to read, and analyzing and synthesizing their research to produce specific products."

A Small but Significant Shift

When students first go through the Question Formulation Technique, some take to it more quickly than others. But teachers consistently report that they are struck by how students who traditionally have not participated at all seem to be most readily activated by this invitation. Soon, these students become experts at asking, refining, and prioritizing questions. They can take themselves through the question formulation process as part of a homework assignment. They can use it as a prereading activity on their own or in class with others. They can use it to analyze math problems and demonstrate new problem-solving abilities.

Question formulation promotes student voice and critical thinking. As students learn to produce their own questions, they are thinking *divergently*—that is, more broadly and creatively. When they focus on the kinds of questions they are asking and choose their priority questions, they are thinking *convergently*—narrowing down, analyzing, assessing, comparing, and synthesizing. And when they reflect on what they have learned through the process, students are engaged in *metacognition*—they are thinking about their thinking.

Students who learn to use all three of these thinking abilities become more sophisticated questioners, thinkers, and problem-solvers. One student succinctly expressed the effects of this simple but significant shift in traditional classroom practice when she declared that learning how to ask her own questions "made me feel like I was the teacher!"

The Question Formulation Technique Across the Grades

Middle school and high school teachers across all subject areas have found the Question Formulation Technique to be a robust tool for promoting greater student engagement and deeper learning. Here are two examples.

In Middle School

In Joshua Beer's middle school social studies classroom at Goshen-Lempster Cooperative School in Lempster, New Hampshire, the Question Formulation Technique is both a differentiated learning strategy to prepare students for challenging tasks and a formative assessment method to hear what kinds of questions students are asking.

Once, as Joshua's class explored how geography, economics, and culture influence one another, he used the title of a March 26, 2014, NPR report, "In Mexico and U.S., Lime Lovers Feel Squeezed by High Prices" as a question focus to kick off a lesson on United States–Mexico relations. His students generated a wide range of questions, such as, "Why would lime lovers feel squeezed by high prices?" "Is it only Mexico or the U.S. that feels squeezed?" and "Why do limes have high prices?"

Because their questions set a self-directed, active learning agenda, Joshua's middle school students were better prepared to listen to, comprehend, and discuss the radio report.

In High Schools

In his, geometry class at Rio Americano High School in Sacramento, California, George Marenco uses the Question Formulation Technique to pique students' interest, facilitate deeper learning, and foster problem-solving skills.

For one lesson, George created a very simple Question Focus, "Equation = Balance." One group of students generated 13 questions, including "How do you get an equation to balance?"; "Does an equation have to be balanced?" (which they later changed to the open-ended question, "Why does an equation have to be balanced?"); "Why is there an equal sign between the words?"; and "What steps do you use to get an equation to balance?" Their subsequent investigations dove deeply into mathematical concepts in ways that demonstrated new levels of proficiency.

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