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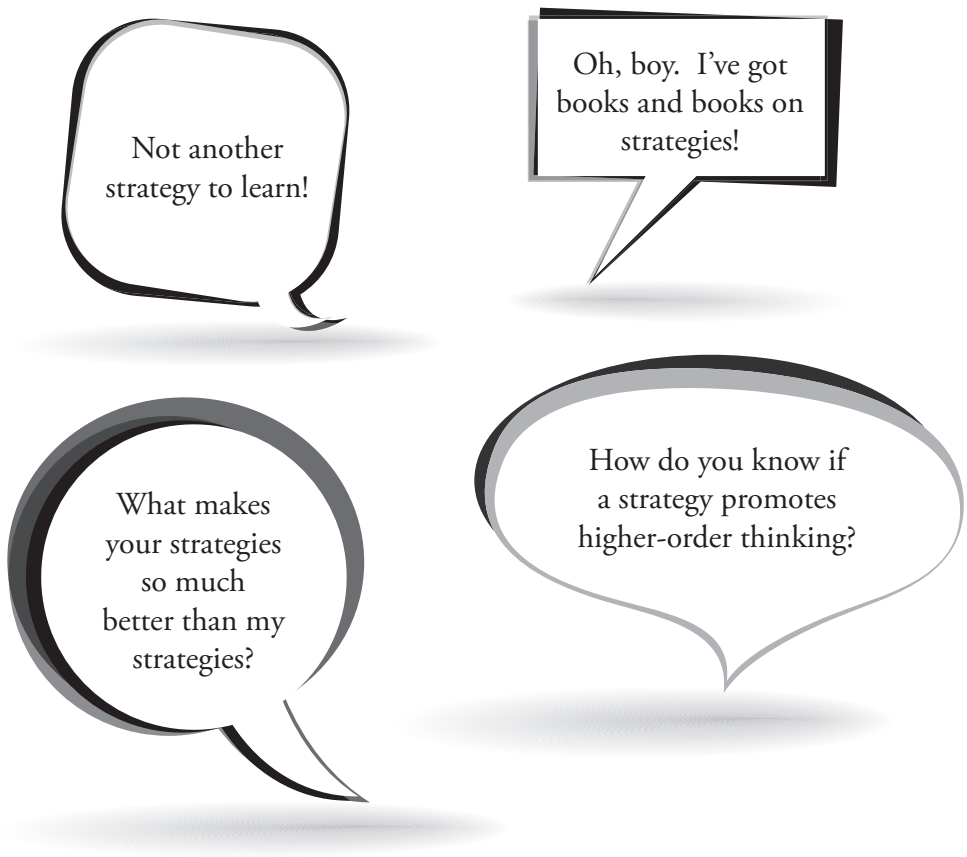
Chapter 5

Strategies for Higher-Order Thinking Skills



There are many strategies that promote higher-order thinking skills. This chapter contains just a sampling of ways to infuse curriculum with specific strategies that promote higher-order thinking skills. These strategies include questioning strategies, problem-solving strategies, decision-making strategies, idea-generating strategies and activities, thinking organizers, creative strategies, project-based learning, and open-ended tasks.

The Socratic Method

Inquiry is at the heart of the Socratic seminar, Socratic dialogue, or Socratic method, as it is most commonly called. This strategy is named after the philosopher Socrates, who used a broad form of questioning with his students. Each question that is answered predetermines the next question. Socrates used it to show his students the error of their thinking. Since the time Socrates used inquiry to promote thinking, the Socratic method has changed somewhat through the years. Today, this method is used primarily as a process of inductive questioning, through small steps, with knowledge as the goal. In a classroom, a teacher can use a set of questions to provoke students to think about something. The questions push students to examine what they know with the result of them analyzing a topic in depth.

By using the Socratic method, learners can come to value and recognize good questions while also improving upon a thoughtful method of thinking. Students become more curious about the topic. They experience the joy of discovery. Students also get immediate feedback, and teachers can monitor student understanding by making adjustments, clarifying, and correcting misgivings immediately instead of waiting until the end of the unit test to find out that students did not understand the material. For the teacher, teaching is more interesting because he or she can quickly glean the thought processes of the students. Classes will respond differently, so even content-area teachers who teach the same class multiple times daily will not grow bored with student responses. This method also allows teachers to see student potential, as some students might pose exceptional questions that might not happen during a regular class.

Some might mistakenly think that the Socratic method requires very little preparation. On the contrary, to implement the Socratic method in class, there is strategic teacher preparation involved. First, teachers should make a list of good questions to ask and mentally go through the conversation beforehand. The first questions are designed to show what students understand about the topic so the teacher knows where to begin. The questions need to follow a logical sequence of steps that

takes learners from one point of knowledge to another. The questions should follow a logical path that supports what the teacher wants students to learn. These questions should be specific enough to lead students to the desired understanding while also engaging students so that curiosity is piqued.

If students answer incorrectly, a teacher must decide whether students need to know why their answer is wrong or not. Not all questions will be the best or even appropriate, so teachers need to be open to the idea of fine-tuning how they question their students.

Dr. Richard Paul is the director of research and professional development at the Center for Critical Thinking and chair of the National Council for Excellence in Critical Thinking. He has classified Socratic questions into six different categories which are listed in the figure on the following page. Within each category, there are questions that support the area of focus. It is the basic practice that, while these do not follow a hierarchy of questions, they can lead one to another (Paul and Elder 2002).

Socratic Questions

Questions that clarify	• What is an example of…? • Can you explain…? • How would you say this in your own words? • What is the right way to define this?
Questions that probe assumptions	• Why do you think this way about…? • What are your assumptions? • What do you believe to be true? • What else could we believe about this?
Questions that look for reasons and evidence	• What makes you believe this? • How do we know this is true? • What else do we need to know? • What would make you change your mind about…?
Questions about perspectives and viewpoints	• Whose viewpoint is this? • What bias does this have? • What is another view about…? • How many more perspectives could there be about…?
Questions that look at consequences	• How does this affect…? • Why is this important? • What effect can this have on…? • If this is true, then what else might be true?
Questions about the question	• What does this question mean? • Is this a good question? • Why was this question asked? • What does this have to do with our lives?

(Adapted from Paul and Elder 2002)

Depth of Knowledge

Depth of Knowledge (DOK) is a scale of cognitive demand that uses questions, tasks, and products ranked at four levels. The scale is adapted from the work of Norman Webb at the University of Wisconsin.

The levels of thinking are differentiated by the complexity of mental processing required. Some equate the idea of difficulty with

complexity. However, the difficulty of a question is usually assessed by how many students can answer the question, do the task, or create the product. Can students find the area of a room? If many students can do this, then it is an easy task. If not many students can do this, then it can be ranked as a difficult task. Depth of Knowledge relies on complexity, not difficulty. It focuses on the complexity of the mental process that it takes for students to answer questions, perform tasks, or create products.

Level 3 is strategic thinking and requires a deep understanding of the story, the character, and humankind. It is open-ended, but students must take what they know about the character and put together probable events and experiences that impacted that character. Level 2 is more complex than Level 1 because students are comparing the character to themselves, so their answers will vary. Level 1 only asks students to describe the character based on what they have read, so it is a simple recall question.

The four levels of thinking are as follows:

- **Level 1** is described as the recall level, where facts, information, or procedures are recalled. It requires the lowest level of thinking.

- **Level 2** is described as the skill or concept level. Typically, students classify, organize, estimate, collect, display, observe, and compare data. They use the information they know. This level requires deeper thinking than does Level 1.

- **Level 3** is characterized by strategic thinking. Reasoning, planning, and making conjectures are typical at this level. The open-ended tasks are not necessarily what makes this level a higher-order thinking activity. Higher-order thinking comes into play when students have to defend the reason for selecting their answers. Students draw conclusions, support their conclusions with evidence, or determine which concept to apply to solve a problem.

- **Level 4** is described as extended thinking and is the highest level of thinking. It is characterized by complex reasoning by which students make interdisciplinary connections. More often than not, activities at this level take a prolonged period of time. However, be aware that just because a project takes an extended period of time to complete it does not mean that it is a Level 4 task. Level 4 requires an investigation of some sort with a project showing the results of the complex thinking involved. The following Level 4 activity can be added to the example on characteristics of a character.

Look at five of your favorite stories, television shows, or movies and choose a character from each one. Combine characteristics from those five characters to create one character that could be friends with the main character in the story you are reading. First, detail what characteristics you would use from each character. Then, draw a picture of this new character and make notes on the page that show why this character would be a likely friend of the main character. What does he or she think? How does he or she act? What would he or she say? What is his or her personality like? Be sure to show this character in detail and be ready to explain why this new character is perfect as a friend to the main character as well as how the story would change with this newly added character.

The key to the different levels of thinking is not necessarily in the verbs that are used; rather, it is in the depth of thinking that is demanded. What comes after the verbs classifies the level of thinking. For example, there are some verbs that do identify with a lower depth of thinking such as *recall* and *identify*. However, the verbs *describe* and *explain* could be used with different levels depending on what needs to be described and explained. The verbs *must* be considered in context. Consider the following example:

Level 1—*Describe* the main character in the story.

Level 2—*Describe* how you are both similar to and different from the character in the story.

Level 3—*Describe* the possible events that could have led to how the character came to be this way and give reasons for your answer.

Similarly to Bloom's Taxonomy, Depth of Knowledge levels can be cumulative. For example, Level 3 and Level 4 questions and activities often will contain Levels 1 and 2. When planning lessons, try to use more of the Levels 3 and 4, which promote higher-order thinking. Decide what students will research and what final project or product they will produce to show what they have learned in a creative way. These activities should incorporate interdisciplinary activities when possible.

Problem-Solving Strategies

Problem-Based Learning

Problem-based learning is a problem-solving strategy that engages students in solving a *real-life or lifelike* problem. These problems can range from students breaking the dress code to establishing safe evacuation routes for hurricane warnings. This strategy is known for its group work along with independent investigations and inquiry. According to James Rhem (1998), problem-based learning "orients students toward *meaning-making* over *fact-collecting*. They learn via contextualized problem sets and situations" (1998, 1). Problem-based learning as we know it today was first used in the 1950s at Case Western Reserve University. It is described as "a curriculum development and instructional system that simultaneously develops both problem-solving strategies and disciplinary knowledge bases and skills by placing students in the active role of problem solvers confronted with an ill-structured problem that mirrors real-world problems" (Finkle and Torp 1995, 1). Even before the 1950s, John Dewey had the right idea about learning. In the 1930s, Dewey (1916) said that school should be lifelike instead of merely preparing students for life. It has been said that using a problem-based approach to learning may be one of the best ways to understand concepts within

a subject area (Barell 2003). Teachers who use a problem-based approach in the classroom not only help students grasp particular concepts but they also pave the way for future learning. Once students learn how to solve one problem, they can transfer that knowledge to solve more problems (Bransford, Franks, and Sherwood 1986). An added benefit is that students remember what they learn because they have opportunities to apply the concepts in more complex ways.

Problem-based learning gives students the opportunity to collaborate with their classmates as they study the issues surrounding a certain problem. They use information they find through research to synthesize viable solutions. The amount of direct instruction in a problem-based classroom is very limited, so students have to take on the responsibility for their own learning. The teacher's role is much like a coach. He or she presents the problematic situation, becomes the subject-matter expert, acts as a resource guide and consultant, and serves as a co-investigator who keeps the students on task. The teacher asks questions like, *Why? What do you mean? How do you know that is true?* He or she questions students' logic and gives hints about erroneous reasoning and models critical thinking so that students will begin to ask the same kinds of questions of one another. The student's role is that of a participant who grapples with the complexity of the situation while investigating and resolving the problem from the inside out.

Think about this scenario as a student in today's classroom:

> *Vandalism is on the rise in your school. Lockers have been broken into, students' belongings have been stolen, furniture has been scratched, and walls have been written on during school hours. The school has decided to implement safety measures. Hall passes will be strictly enforced, and no one will be allowed to leave the cafeteria during lunch. These rules seem extreme to you. You feel that innocent students are being punished for what only a few do. There has to be a better way to stop the vandals. What can you do?*

Your teacher allows you to work in groups to generate possible ideas or solutions to this problem. You decide to write a petition, form volunteer patrols, and survey students. You identify available information related to this problem by reviewing school policies, viewing a sample petition, and looking at parts of the school that have been vandalized. You identify issues that need to be investigated further—how to form patrols, what other schools are doing, and how to write a survey. Your group finds resources to consult, like policies from other schools and sample surveys. Group members are assigned the tasks above and information is gathered. Finally, your group presents your solution to the school board. This is problem-based learning.

There are many reasons for using problem-based learning with students. First, we know that our minds are capable of thinking through complex situations, which promotes higher-level thinking skills. Research says that it is the complex challenges that develop our intellect and ability to think productively (Caine and Caine 1997; Diamond and Hopson 1998). These types of problems do not provide just one right answer. Students are forced into thinking both critically and creatively as they seek to find solutions to problems.

Problem-based learning also increases motivation in students. Recently, some professors at the college level have begun to restructure their course work around problem-based learning. They do this by taking the final exam and working backward to structure the course around a problem that teaches the key concepts they want their students to learn. They freely admit that it is a lot of work to do this but that the results of both student and teacher engagement are well worth it. In fact, they dare say that none of their colleagues have gone back to lecture after using problem-based learning (Rhem 1998). Students see that the outcome of their work can make a real difference in society. It shows that what they do in school can have an impact in the real world, and this builds student confidence.

This type of learning provides opportunities for students to work with others in collaborative groups, which in turn prepares them for their future workplaces where teamwork is both valued and required. In a successful problem-based learning activity, students must listen to one another, synthesize information, and work together. For some students, this can be difficult. Some teachers feel more daunted by this classroom structure than anything else. It does take patience and strategic planning on the teacher's part to train students to work effectively together. Typically, no one has trouble working with others who respect their opinions, listen to their ideas, and try to compromise in one way or another. The problems arise when the exact opposite is true. While it can be a bother to put out fires all day long, providing students with the encouragement, strategies, and experiences of dealing with difficult people is invaluable. Problem-based learning provides the perfect avenue to teach students how to work with others.

While collaborating, great ideas can flow freely. Brainstorming with others brings out creative ideas that might not have been evident if students had been working alone. Problem-based learning is continual brainstorming of what the problem is and how it can be solved. As one student shares, it might spark an idea in another student. It teaches students to appreciate other viewpoints and ideas.

Problem-based learning provides students the chance to develop strong work ethics. So much work, energy, and thinking goes into solving problems. Strategies are generated for identifying and defining the problem, gathering information, analyzing data, and building and testing the hypothesis. All of these steps are important life skills that train students to be hard workers.

Finally, problem-based learning is active. A problem-solving context is the best way to acquire information (Tyler 1949). As students struggle to figure out a problem and apply what they are learning, they are more likely to remember the key concepts taught in that lesson. The way that students are engaged in learning information is similar to the way students will recall it and use it in the future.

A typical problem-based learning lesson has several cycles. These steps can be repeated as many times as necessary to come to a conclusion. The steps are the following:

1. Locate a real-world problem. It is best if this problem can connect to learning standards and goals.

2. Determine facts and find a way for students to enter the problem. Tie it to something that they are interested in. This is called the *hook*.

3. After the problem has been presented, students discuss what they know to be the facts of the problem. They can use a graphic organizer like the KWHLAQ strategy (Barell 2003; 2007a; 2007b) to do this.

4. Students analyze the problem, brainstorm ideas about the problem, and create an exact statement of the problem. This is the hypothesis. The problem statement might sound like this: *How can we . . . in such a way that . . . ?*

5. Students need to identify information necessary to understand the problem and identify resources to be used to gather information.

6. Students find and share information by interviewing, collecting data, and conducting other forms of research. They can revise the problem statement and ask additional questions if necessary.

7. Students develop solutions by studying the information, finding a solution that fits best, and considering the consequences for their solution.

8. Students develop some sort of presentation where they explain, apply, and justify their solution to the problem. Their information can be published for others to see.