Thinking Skills and Constructivism… Questions are the technology of Learning

The ability to think—to be a lifelong seeker and integrator of new knowledge—is based on the ability to ask and consider important questions. How else can we gain, analyze, and integrate new information unless we can ask questions that force us to do these things? People are not simply receptacles of information. Indeed, the whole constructivist theory rests on this belief. ***People wonder, gather, organize, and analyze information and then reach conclusions that make sense to them***.

Why is being an effective questioner essential to being an effective thinker and learner?

- The complexity of the world is increasing rapidly with the rise of technology. We have access to much more information than the generations before us did, and that information changes with intimidating speed. The half-life of an engineering degree is currently estimated at four years. That is, in four years, half of what an engineering graduate has learned becomes obsolete (Rubenstein, 1998)—a daunting statistic. Unless that engineer can access and integrate new information, he or she cannot remain current. In the face of such rapid and exponential change, no one can rely solely on experience and accumulated knowledge. Content mastery is not a static state but an evolving and lifelong process.
- ***The workplace and schools increasingly call for teams of people to work effectively to analyze and resolve issues.***
- ***It is important not only to ask the right questions but also to ask them in a logical sequence. Without a sequential questioning strategy, groups often flounder, go off track, or overlook essential information.***

Appropriate Strategies

Educators have long recognized the value of asking important questions. However, they are increasingly aware of the importance of asking questions that go beyond recall and that stretch student thinking. Two familiar questioning models and strategies—Socratic questioning and Bloom's taxonomy—have raised the awareness and the ability of teachers to ask a broad range of questions. But most questioning strategies have significant deficiencies.

- Most questioning strategies, although effective at stimulating thought about a given point, do little to help students integrate their thinking and produce a logical, well-considered conclusion or point of view that builds on previous questioning or thinking. Questions appear to be almost random.
- The questions still reside with the teacher. But to develop the thinking and questioning abilities of students, the questions must reside with the students. ***We need to help students develop the capability to ask tough and meaningful questions.***

- Effective teacher-generated questioning strategies encourage students to think but not necessarily to become better questioners. Indeed, Carin and Sund demonstrated that students attain significantly higher levels of thinking when they are encouraged to develop skill in generating critical and creative questions and when they are provided opportunities for dialogue with classmates about the questions posed and conclusions derived from information they encounter. (Cecil, 1995, p. 36)

We need question-driven problem-solving strategies that are

- ***comprehensive—they invite consideration of all relevant variables, perspectives, and information;***
- ***adaptable—they apply to student populations that vary by grade level and by ability and to different curriculum material;***
- ***discriminating—they accommodate the requirements of different situations;***
- ***productive—they produce some outcome, resolution, or conclusion; and***
- ***transferable—students can be taught these strategies so that they ask the questions.***

These strategies need to be sophisticated enough to account for the complexities of a wide range of issues or dilemmas, yet simple enough for all age and ability levels to apply.

Most problem-solving strategies use the same approach for all situations, and they are typically not question-driven. Questions enable us to access and analyze information and draw sound conclusions. In addition, good questions stimulate thinking and creativity.

Different types of situations require different approaches. For example, gathering facts to determine why something has occurred requires a different type of thinking—and a different approach—than projecting into the future to anticipate what might happen. We have identified four types of situations, each with its own characteristics: complex situations, problem situations, decision situations, and implementation situations. Each situation also requires a different path toward resolution. In our work with schools and with the ASCD CompassQuest consortium (see sidebar), we teach four question-based problem-solving strategies, one for each situation. We derived the strategy names from the problem-solving steps: SCAN, FIND, SELECT, and PLAN (fig. 1).

Figure 1. Problem-Solving Strategies from Compass Quest

Situation	Definition	Requirements	Compass Quest Strategy
Complex situation	Multifaceted scenarios have multiple variables and opinions.	Understanding of relevant variables, their priorities, and possible action plans	• **S**ee the issues • **C**larify the issues • **A**ssess priorities • **N**ame next steps
Problem situation	Something has gone wrong or an unknown cause has produced some undesired effect.	Analysis of relevant data to evaluate possible causes and determine true cause	• **F**ocus on the problem • **I**dentify what is and is not • **N**arrow possible causes • **D**etermine true cause
Decision situation	One course of action or solution must be selected from among several possible options.	Selection of the best possible option after evaluating options against criteria and then considering risks	• **S**tate the decision • **E**stablish and classify objectives • **L**ist alternatives • **E**valuate alternatives • **C**onsider risks • **T**rust your work—pick a winner!
Implementation situation	Upcoming plans, changes, and actions will be implemented.	Identification of actions needed for successful implementation after identifying potential problems and how to handle them	• **P**redict potential problems • **L**ist likely causes • **A**gree on preventive actions • **N**ote contingent actions

Implementing the Theory

The central problem that Constructivist educators face is not a [lack of] guiding theory, but concrete strategies and tools for institutionalizing these theoretical and practical understandings into more inclusive classrooms. (Hyerle, 1996, p. 15)

As brain studies and other research continue to accumulate support for the constructivist perspective, educators must equip teachers and students with the skills that will make these worthy principles a reality in more classrooms. One way is through teaching students the questioning approaches that will allow them to

- express, evaluate, and reevaluate their own opinions and comprehension;
- expand their understanding on a given topic;
- seek out and consider alternative viewpoints;
- experience the dilemmas of others by sorting through and weighing similar issues;
- refine their understanding by accommodating and considering relevant data and alternative perspectives; and
- demonstrate their understanding by considering relevant facts and issues.

The constructivist toolbox needs many tools, but surely one is a systematic approach that helps students ask important questions to successfully assess or resolve a difficult issue or problem. Ernest Boyer, president of the Carnegie Foundation for the Advancement of Teaching, proclaimed, "An educated person today is someone who knows the right question to ask" (Fiske, 1995, p. 65). By helping our children learn how to ask—as well as to answer—important questions, we help ensure that they have an education for life.

Reference: Helping Students Ask the Right Questions; Cynthia Richetti and James Sheerin

Costa

Questioning and Posing Problems

The formulation of a problem is often more essential than its solution, which may be merely a matter of mathematical or experimental skill.

To raise new questions, new possibilities, to regard old problems from a new angle, requires

creative imagination and marks real advances..... Albert Einstein

One of the distinguishing characteristics between humans and other forms of life is our inclination, and ability to FIND problems to solve. Effective problem solvers know how to ask questions to fill in the gaps between what they know and what they don't know. Effective questioners are inclined to ask a range of questions. For example: requests for data to support others' conclusions and assumptions—such questions as,

"What evidence do you have.....?"

"How do you know that's true?"

"How reliable is this data source?"

They pose questions about alternative points of view:

"From whose viewpoint are we seeing, reading of hearing?"

"From what angle, what perspective are we viewing this situation?"

Students pose questions, which make causal connections and relationships:

"How are these people (events) (situations) related to each other?"

"What produced this connection?"

They pose hypothetical problems characterized by "iffy"-type questions:

"What do you think would happen IF.....?"

"IF that is true, then what might happen if....?"

Inquirers recognize discrepancies and phenomena in their environment and probe into their causes: "Why do cats purr?" "How high can birds fly?" "Why does the hair on my head grow so fast, while the hair on my arms and legs grows so slowly? "What would happen if we put the saltwater fish in a fresh water aquarium?" "What are some alternative solutions to international conflicts other than wars?"

Some students may be unaware of the functions, classes, syntax or intentions in questions. They may not realize that questions vary in complexity, structure and purpose. They may pose simple questions intending to derive maximal results. When confronted with a discrepancy, they may lack an overall strategy of search and solution finding