Can Effective Questioning Strategies Stimulate Quality Thinking?

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Primary Objectives

- Identify effective questions
- Share expertise
- Have fun!
What do we want to know about questioning strategies?

- How can questions lead to increased understanding?
- What kinds of questions stimulate higher-order thinking and lead students to better conceptual understanding?

Lake Peigneur Disaster: [http://www.youtube.com/watch?v=_feWtkSucvE](http://www.youtube.com/watch?v=_feWtkSucvE)
Sodium Chloride Experiment

Key Question: What happens to the temperature of ice water when NaCl is added?

While you conduct the experiment

On a piece of white paper,

list ten questions

teachers might ask students
to facilitate the learning.
Problem/Common Assumption in Hands-on Experiments

• Simply engaging in hands-on, inquiry-based activities does not necessarily lead students to conceptual understanding.

Solution:

• Posing *probing* questions while students explore enables them to think about their observations and construct meaningful knowledge.
The kinds of questions teachers ask affects the level of thinking that students achieve.
Research indicates that teacher-initiated questions can enable students to think in new and different ways and develop effective ways of thinking and learning.
Effective questions can:

- Motivate and sustain interest
- Develop and modify attitudes
- Stimulate thinking
- Solve problems
- Inspire ideas
- Encourage Inductive and deductive reasoning
The Questions Teachers Ask

Research says that the questions teachers ask are:

**Recall Questions**

Who invented the light bulb?

**Procedural Questions**

Henry, turn on the lights?

**Thinking Questions**

How has the light bulb changed the way people live?
What percent of these questions do teachers ask?

- **Recall Questions**: 60%
- **Procedural Questions**: 20%
- **Thinking Questions**: 20%
Sodium Chloride Experiment:
Categorize your ten questions:

Recall.......................... blue dot

Procedural...................... green dot

Thinking............................. red dot
The kinds of questions asked depends upon the structure of the lesson.

Recall: What did we do in class yesterday?

Beginning of the lesson.

Procedural: What is the next step?

Any part of the lesson.

Thinking: How would you summarize the results?

End of lesson.
Different parts of a lesson require different kinds of questions to effectively enable students to construct the knowledge necessary to proceed to the next step.

Questions to focus the learner:

- What do you see happening?
- How will you diagram the results?
Questions to develop the concept:

- What is causing this to happen?
- Why do you think this is happening?
- Based upon what you already know, what do you think will happen next?
Questions to validate the learning:

- What do you think will happen if we change a variable?
- Why do you think changing a variable will make a difference?
- What objects work in a similar way?
The kinds of questions teachers ask influence the level of thinking students engage in.

So what kinds of questions should teachers ask?
If we want students to develop skills in problem-solving and decision-making, we need to ask them questions that will stimulate higher-order thinking skills.

Patricia E. Blosser
What kinds of questions are effective?
Five Types of Questioning

NON-INSTRUCTIONAL QUESTIONS

1. Rhetorical
   Isn’t light a type of wave that carries energy?

2. Procedural
   Can you turn off the light and begin the stopwatch at the same time?

3. Command/Demand
   Can we finish this experiment in the next few minutes?
INSTRUCTIONAL QUESTIONS

4. Narrow Questions
   - Confirming Questions
   - Integrating Questions

5. Broad Questions
   - Open-ended Questions
   - Value Questions
   - Feeling Questions
INSTRUCTIONAL QUESTIONS

Narrow Questions
Structure the learning situation toward a planned, specific goal.

Broad Questions
Structure the learning situation toward unplanned divergent outcomes.
Students take ownership.
Narrow Question
What is light?

Broad Question
How will light effect future technology?
The Level of Thinking Expected by Questions

Narrow Questions:
- Cognitive-memory operations
- Convergent thinking operations

Broad Questions:
- Divergent thinking operations
- Evaluative thinking operations
Narrow questions:
- Check student retention of information
- Focus thinking
- Summarize learning

Broad Questions:
- Promote discussion and interaction
- Stimulate student thinking
- Hypothesize and speculate
- Share ideas
Look at your list of questions about the Sodium Chloride Experiment.

On the red dot, which indicates thinking questions, write:

N = NARROW QUESTION
B = BROAD QUESTION
Narrow Questions

- CONFIRMING
  Recall or recognize information

- INTEGRATING
  Combine or synthesis information
Confirming Questions

**RECALL**

- Who invented the light bulb?
- What did we learn yesterday?
- What improvements did Louis Latimer make to the light bulb?
The value of **Confirming Questions:**

- **Set the stage**
  
  What example did we use when we talked about refraction of light?

- **Focus attention**
  
  What happened when I placed this pencil in a glass of water?

- **Summarize key points**
  
  What properties of light did we discussed today?
Integrating Questions

**EXTEND OR CLARIFY**

• What is the difference between refraction and diffraction of light?

• Which causes rainbows?

• Why is light needed for photosynthesis?
The value of Integrating Questions:

• **Compare and contrast**
  
  How can the speed of light in a solid be compared to the speed of light in a liquid?

• **Explain**
  
  Explain what happens when light is refracted

• **State relationships**
  
  Is there a correlation between light and sound waves?

• **Arrive at a particular conclusion**
  
  Sound waves can diffract, but, can light waves diffract, too?
In review: What have we just learned about narrow questions?
Narrow Questions

Confirming Questions
set the stage, focus the learning, summarize the learning

RECALL

Integrating Questions
compare, contrast, explain, conclude

EXTEND or CLARIFY
Why is it important to ask students a variety of questions?

It is unrealistic to assume that students will acquire all the scientific knowledge they will ever need to know. IT IS EXTREMELY IMPORTANT TO PROVIDE EXPERIENCES THAT DEVELOP SKILLS TO ACQUIRE AND PROCESS DATA INTO USEFUL INFORMATION. Broad questions can help students to develop these skills.
Broad questions require students to utilize thinking processes which synthesize information or ideas in ways which are unique.
Broad Questions

- OPEN-ENDED
- VALUING
- FEELING
➢ Open-ended  
What might be another explanation?

➢ Valuing  
How will that affect future development?

➢ Feeling  
What do you think about the results of your experiment?
The Value of Open-ended Questions

• Synthesize ideas.
• Hypothesize and develop resolutions
• Deduce and predict
• Organize elements in a new way
• Explore or extend ideas
• Brainstorming
• Problem-solving

Ponce de Leon
Open-ended Questions

• What is your hypothesis?

• What can be done to solve this problem?

• What other factors are involved?

• How can these elements be used to devise something new?

• Predict what you think will happen.

• How come?

There could be tons of possible answers!
Silence is Golden

Students need time to THINK and FORMULATE a response

Learn to build in wait time — Ask a question and wait 3-5 seconds!
Silence Works for Open-Ended Questions

Studies show success with extended wait times:

- Length of student responses increased
- Number of unsolicited but appropriate responses increased
- Failures to respond decreased
- Speculative thinking increased
- Confidence increased
- Contribution by slow learners increased
- Student-student comparing increased

What if all I get is silence?

Initiate conversation if necessary

- Reword the question
- Add some questions to help lead them to the current question
- Ask students how they are confused by the question
The value of **Valuing Questions**

- Acknowledge priorities
- Formulate an opinion
- State a preference
- Defend a position
- Justify a choice
Valuing Questions

• Which experiment did you like best?
• Which experiment is more reliable?
• How should this be arranged?
• Why is that one better?
• What will you do first?
• What is your opinion?
• Do you agree?
The Value of Feeling Questions

• Share feelings and emotions
• Awareness of one’s own feelings
• Awareness of other’s feelings
Feeling Questions

• How will you feel if the experiment doesn’t turn out the way you predicted?

• What makes you so concerned about global warming?

• What did you think when you met Neil Armstrong?
Instructional Questions

Narrow Instructional
Confirming
Integrating

Broad Instructional
Open-ended
Valuing
Feeling
How can questions lead to increased understanding?

Effective questions can:

- Set the stage for learning
- Focus the learning
- Reinforce Learning
- Promote discussion and interaction
- Stimulate higher-order thinking
- Encourage hypothesizing and speculating
- Provide an opportunity to share ideas.
What kinds of questions stimulate higher-order thinking and lead students to better conceptual understanding?

Questions that lead to increased conceptual understanding include:

- Questions that elicit a wide range of acceptable responses rather than one correct answer.

- Broad questions such as open-ended questions, valuing questions, and feeling Questions (think of Bloom’s Taxonomy).
What did you learn about asking students questions?