

Questions are the Answer

from *The Science Teacher*, January 1996 by John E. Penick, Linda W. Crow, Ronald J. Bonnsetter

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Answer questions with questions: Often students know more than they think. So, before just answering their questions, probe what they know with additional questions. Below are some examples that may be helpful.

History: *We begin with history because these questions relate to the students' experience... students can almost always talk about what they have done...*

What did you do?
What happened?
What happened next?
What did you do first?
In what order did you...?
What procedure did you use?
What color/temperature/weight/size was it?
What made you think of doing that?

Relationships: *Seeking relationships and patterns is an essential process of science...*

How does this compare to...(other outcomes, procedures/experiments)?
If ____ happened, what happened to ____?
Where have you seen something like this before?
In talking to other students, who else got similar results?
What order does that usually follow?
What seems to be a common element in all your findings?
Where/When/How do you usually find these?

Application: *Applying knowledge is generally acknowledged to be a true test of understanding, as well as the surest way to truly know something...*

How could you use this?
What problems could this solve?
Where can we find examples of this in the real world?
If you wanted to do ____, how would this idea/knowledge/finding/experiment help?
What machine could you build that would do this?

Speculation: *Here students must go beyond the data and information given, abstracting to new and unusual situations...after a student makes an assertion, a teacher might ask a speculation question, such as...*

What if you...changed/eliminated/added/mixed/waited?
What would it take to prove that?
If you wanted to prevent that from happening, what would you do?
If that's true, then...
What might be inside that black box?

Explanation: *Communicating an idea, process, or theory to clarify both the nature of the phenomenon and how it occurs...*

How does that work?
What causes that to happen?
How would ____ cause ____?
How would you change your explanation if I changed this part of the apparatus?
How would it affect your explanation if I ____?
How does your explanation fit this other phenomenon?

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