

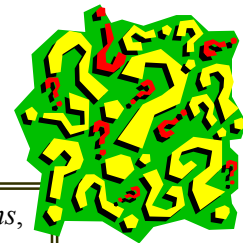
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Getting to the Point of Asking Questions



Source: *Mathematics Assessment: Myths, Models, Good Questions, and Practical Suggestions*, NCTM, 1991. The following excerpt is a direct reprint from the book.

Asking the right questions to prompt student thinking and exploration of mathematics is a true art to be cultivated by both teachers and students. Questions and answers can be oral, written or demonstrated by actions. Here are some suggestions for assessment questioning:

1. ✓ Prepare a list of possible questions ahead of time, but if possible, be flexible.
 - 2.
 - 3.
 - 4.
 5. ✓ Use plenty of wait time; allow students to give thoughtful answers.
 - 6.
 - 7.
 - 8.
 - 9.
 10. ✓ Encourage student to listen to your questions (even write down their own list of good questions) so that they can guide their own thinking on future problems.
- ✓ Leading questions and feedback are not generally used for formal assessment, although some assessment techniques include teaching during the examination.
 - ✓ Make a written record of your observations. A checklist may or may not be appropriate.

Here is a starter list of possible questions to open new avenues of thinking for students. Please don't stop with these...add to your collection as you get new ideas.

SAMPLE QUESTIONS

Problem Comprehension

Can students understand, define, formulate, or explain the problem or task? Can they cope with poorly defined problems?

- ✎ What is this problem about? What can you tell me about it?
- ✎ How would you interpret that?
- ✎ Would you please explain that in your own words?
- ✎ What do you know about this part?

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- ✎ Do you need to define or set limits for the problem?
- ✎ Is there something that can be eliminated or that is missing?
- ✎ What assumptions do you have to make?

Approaches and Strategies

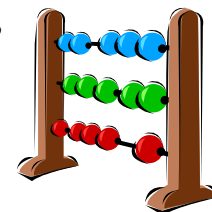
Do students have an organized approach to the problem or task? How do they record? Do they use tools (manipulatives, diagrams, graphs, calculators, computers, etc.) appropriately?

- ✎ Where could you find the needed information?
- ✎ What have you tried? What steps did you take?
- ✎ What did not work?
- ✎ How did you organize the information? Do you have a record?
- ✎ Did you have a system? A strategy? A design?
- ✎ Have you tried (tables, trees, lists, diagrams,...)?
- ✎ Would it help to draw a diagram or make a sketch?
- ✎ How would it look if you used these materials?
- ✎ How would you research that?

Relationships

Do students see relationships and recognize the central idea? Do they relate the problem to similar problems previously done?

- ✎ What is the relationship of this to that?
- ✎ What is the same? What is different?
- ✎ Is there a pattern?
- ✎ Let's see if we can break it down. What would the parts be?
- ✎ What if you moved this part?
- ✎ Can you write another problem related to this one?



Flexibility

Can students vary the approach if one approach is not working? Do they persist? Do they try something else?

- ↳ Have you tried making a guess?
- ↳ Would another recording method work as well or better?
- ↳ What else have you tried?
- ↳ Give me another related problem. Is there an easier problem?
- ↳ Is there another way to (draw, explain, say,...) that?



Communication

Can students describe or depict the strategies they are using? Do they articulate their thought processes? Can they display or demonstrate the problem situation?

- ↳ Would you please reword that in simpler terms?
- ↳ How would you explain what you know right now?
- ↳ How would you explain this process to a younger child?
- ↳ Could you write an explanation for next year's students (or some other audience) of how to do this?
- ↳ Which words were most important? Why?

Curiosity and Hypotheses

Do students show evidence of conjecturing, thinking ahead, checking back?

- ↳ What do you predict will happen?
- ↳ What was your estimate or prediction?
- ↳ How do you feel about your answer?
- ↳ What do you think comes next?
- ↳ What else would you like to know?

Self-Assessment

Do students evaluate their own processing, actions, and progress?

- ↳ What do you need to do next?
- ↳ What are your strengths and weaknesses?
- ↳ What have you accomplished?

- ↳ Was your own group participation appropriate and helpful?

Equality and Equity

Do all students participate to the same degree? Is the quality of participation opportunities the same?

- ↳ Did you work together? In what way?
- ↳ Have you discussed this with your group? With others?
- ↳ Where would you go for help?
- ↳ How could you help another student without telling the answer?
- ↳ Did everybody get a fair chance to talk, to use the manipulatives, or to be recorder?

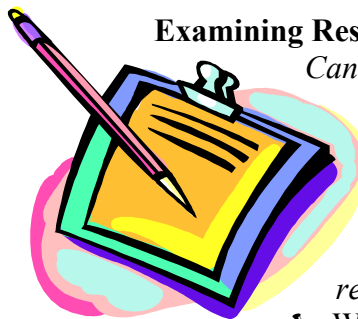
Solutions

Do students reach a result? Do they consider other possibilities?

- ↳ Is that the only possible answer?
- ↳ How would you check the steps you have taken, or your answer?
- ↳ Other than retracing your steps, how can you determine if your answers are appropriate?
- ↳ Is there anything you have overlooked?
- ↳ Is the solution reasonable, considering the context?
- ↳ How did you know you were finished?

Examining Results

Can students generalize, prove their answers? Do they connect the ideas to other similar problems or to the real world?



- ↳ What made you think that was what you should do?
- ↳ Is there a real-life situation where this could be used?
- ↳ Where else would this strategy be useful?
- ↳ What other problem does this seem to lead to?
- ↳ Is there a general rule?
- ↳ How were you sure your answer was right?

- ↳ How would your method work with other problems?
- ↳ What questions does this raise for you?

Mathematical Learning

Did students use or learn some mathematics from the activity? Are there indications of a comprehensive curriculum?

- ↳ What were the mathematical ideas in this problem?

- ↳ What was one thing you learned (or two, or more)?
- ↳ What are the variables in this problem? What stays constant?
- ↳ How many kinds of mathematics were used in this investigation?
- ↳ What is different about the mathematics in these two situations?
- ↳ Where would this problem fit on our mathematics chart?



Questions and Answers

Here are some frequently asked questions and answers regarding the 2002-03 District Mathematics Assessments.

Why did the teachers need to get together at the school to score the assessments?

There are several reasons the teachers needed to get together and score the assessments and all of the reasons are interrelated. First the teachers needed to be able to talk to one another about the mathematics inherent in the performance tasks and be able to discuss the mathematics standards at each grade level. It gave teachers a common task to review student work and be able to have conversations about what kind of work a student would need to do to be proficient mathematician. With the tasks being vertically aligned to the standards, teachers could assess the student's work and determine where along the standard continuum the student really was with their mathematics. Teachers could use this information to evaluate their individual classroom instruction and take a more in depth look at the mathematics program at the school.

What will happen with the student work and the results now that I have returned the tasks to RDA?

Once RDA has received the tasks, trained scorers score the student's math work for a third time. This takes several weeks to complete because there are more than 3500 tasks to be scored at the elementary and middle school level. Once the scoring is complete, the bubble sheets will be scanned and edited. At this time the data will be analyzed and the formal reports will be written. Sometime in January, formal reports are written, the student work and the individual scoring worksheets will be returned to the math contact at the school. Teachers at the school should review the preliminary results of the triple scoring.

How will the math performance tasks help prepare my students for the State's Standards-Based Assessment being administered in grades 4 and 8?

This year during the state mandated testing, the students will be asked to answer both multiple-choice and constructed –response items. The constructed-response items require the students to demonstrate their ability to solve the mathematics problems. Using the performance tasks in the classroom will give the students the needed practice and experience solving open ended, math rich problems, which will help prepare the students to solve the constructed-response questions.

The APS performance-based mathematics assessments (both the task bank and the district assessments) are aligned to the State and District's mathematics standards. Using the tasks as instructional tools in the class will help the teacher identify the level of mathematics performance of the students and provide information to the teacher on the next steps for instruction.