Elicitation Strategy: Flip-the-Question

Flip-the-Question is a strategy for posing mathematics questions to students to uncover their thinking. It can be used both to raise the level of cognitive demand of a math problem and to provide information to a teacher about the depth of a student's understanding.

Particular Advantages

- Provides information about students' understanding of the conceptual underpinnings of certain mathematics procedures
- Easy to implement, particularly for questions related to mathematical procedures
- Calls for higher order thinking skills

How Does the Strategy Work?

Start with questions of the form "If I give you <this information>, you calculate <this result>," and revise them into questions of the form "If you have <this result>, what information would you have started with?" Provide some time for students to think on their own before having them discuss their thoughts with a partner or as part of a full-class discussion.

Example

This strategy is best suited to questions that are focused on applying a procedure to calculate an answer. The revised question embeds the resulting correct answer in the question and asks students to think about what mathematical conditions could have produced that result.

For example:

Instead of asking: . . .	. . . the teacher asks:
What is the mean (average) of the numbers 7, 9, 11, 8.5, 7.5, and 5?	*What is a set of six numbers whose mean (average) is 8?*
What is the area of a triangle with a base of 10 and a height of 6?	*What is a possible base and height of a triangle with an area of 30 in²?*
What are the common factors of 32 and 20?	*A pair of numbers has common factors of 2 and 4 only. What could the numbers be?*
$\frac{1}{3} \times \frac{3}{4} = ?$	*What pair of fractions could you multiply to get $\frac{1}{4}$?*

How Does the Strategy Support Formative Assessment?

Eliciting and interpreting evidence

- Students frequently need to draw on their conceptual understanding of the topic in order to answer the flipped question. Teachers can use this strategy to gather information about students' understanding of the conceptual underpinnings of a procedure.

- Because flipped questions often have more than one correct answer, they lead naturally into follow-up questions that provide a much broader picture of what a student knows. For example, a student responds that a possible base and height of a triangle with area 30 in^2 is 6 and 10. The teacher can then follow up with questions like "What is another base and height that also work?" or "Is that the only possible base and height?" These questions provide the teacher with a much fuller picture of the student's understanding of the area formula than seeing a student find the area of a triangle with base 6 and height 10.

Environment

- Flipping the question can often result in a mathematics question that is both attainable by most students (many of the questions could be explored with guess-and-check, even though that is not efficient), yet also can draw on higher order thinking skills as students analyze and test their ideas. These kinds of questions invite students to make the connections between mathematical ideas and to draw conclusions that are the punchlines of a lesson.

How Might You Modify the Strategy, and Why?

Broaden the flipped question to ask about the range of possible solutions. For example:

Original question:	Flipped question:	Broadened question:
What is the area of a triangle with a base of 10 and a height of 6?	*What is a possible base and height of a triangle with an area of 30 in^2?*	*How many possible whole-number bases and heights of a triangle with an area of 30 in^2 can you find?*
$\frac{1}{3} \times \frac{3}{4} = ?$	*What pair of fractions could you multiply to get $\frac{1}{4}$?*	*What are three different pairs of fractions that each have a product of $\frac{1}{4}$?*

What Are Some Considerations for Using the Strategy?

When using this strategy, be clear what mathematics you want to bring out from the flipped question and what you want students to learn from the problem posed. Not every problem must be modified, and it may be sufficient to flip the question for only one or two problems as the basis for an interesting mathematical discussion.