

Elicitation Strategy: Error Analysis

The **Error Analysis Strategy** is a strategy for gathering evidence of students' thinking, in which the teacher presents the class with a fictitious student response to a problem and asks them to figure out what the fictitious student did wrong or was reasoning about the problem. The fictitious response is designed to highlight a common student misconception that the teacher wishes to address with his or her students. It can be used both to probe the nature of students' thinking about the problem and to surface any similar misconceptions held by the students.

Particular Advantages

- Models the analysis of mistakes as a learning opportunity
- Often highlights a common misconception, creating an opportunity to discuss the misconception before it arises
- Provides a safe opportunity to assess student work since the work is anonymous and fictitious

How Does the Strategy Work?

1. Prior to using the strategy, the teacher identifies one or two errors for the class to analyze and finds or generates student work that illustrates the errors or misconceptions in the work.
2. Students first complete the problem on their own to gain familiarity with it. The teacher can choose whether to project the problem for the class or provide it individually on a handout.
3. The teacher then shows the class a fictitious student response and asks students to think about (or talk with a partner or small group about) the approach and reasoning shown in the response.
4. The class then discusses various ideas about the response. The goal of the conversation is to help students understand the nature of the errors or misconception and to be aware of it in their own work.

Example

For example, a teacher wishes to find out more about his or her students' understanding of comparison of fractions. The teacher knows that one common misconception is the overgeneralization of the idea that "the smaller the denominator, the larger the fraction." While this is true for unit fractions (i.e. $\frac{1}{3}$ is larger than $\frac{1}{4}$), students can sometimes extend this rule to all fractions, believing that $\frac{2}{5}$ is larger than $\frac{7}{9}$ because fifths are larger than ninths. So the teacher presents a fictitious student response that says:

$\frac{2}{5} > \frac{7}{9}$. If the denominator is bigger, the pieces are smaller. So the first fraction has bigger pieces. $\frac{2}{5}$ is bigger than $\frac{7}{9}$.

He or she then says to the class:

This student is not correct, although some of his or her ideas are correct. What parts of the thinking are correct, and which parts are incorrect?

How Does the Strategy Support Formative Assessment?

Eliciting and interpreting evidence

- Teachers get information about the extent to which students may share the misconception provided in the response from the discussion that ensues, as students share their ideas about the fictitious response. Some students may pose additional questions, others may make assertions that correctly identify what was erroneous, and still others may make assertions that are themselves erroneous.

Student ownership and involvement

- Error Analysis helps students develop self-regulation skills as they practice analyzing the thinking and reasoning of others. As they gain experience with this kind of analysis, they can begin to apply it to their own mathematical reasoning.
- Error Analysis can boost students' confidence in their own reasoning by providing an acknowledgement that some misconceptions are based on thinking that is correct in certain mathematical settings but may have been applied to an incorrect mathematical setting—and thus gives credit for the validity of the initial thinking.

Environment

- Error Analysis also provides a learning environment where it is safe to be wrong and promotes the message that the teacher is interested in uncovering and understanding people's thinking rather than simply judging its accuracy.

How Might You Modify the Strategy, and Why?

For early attempts, consider showing and discussing one student's analysis of the work of another student. Once the class feels comfortable discussing errors together, you might ask students to share their own responses for discussion.

Students with organizational difficulties may benefit from a step-by-step organizer to help them go through an analysis process.