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An Introduction to Formative Assessment Classroom Techniques (FACTs)

WHAT DOES A FORMATIVE ASSESSMENT-CENTERED CLASSROOM LOOK LIKE?

In a primary classroom, students are having a "science talk" to decide which organisms illustrated on a set of cards are called "animals." After using a *Card Sort* strategy to group the cards as "animals" and "not animals," the teacher encourages the students to develop a rule that could be used to decide whether an organism is an animal. The students share their ideas, openly agreeing or disagreeing with their peers. The teacher records the ideas that are most common among students and notes the reasoning students use. She notices many students think animals must have fur or legs and that humans are not animals and makes note of this to address in the next lesson. She then gives students an opportunity to regroup their cards, using the rule they developed as a class. She listens carefully as students explain their reasoning based on the "animal rule" they developed. The teacher adds new cards to the *Card Sort.* Some students decide

they need to revise the rule to fit the new cards. The teacher probes deeper to find out why some students revised their thinking.

In an intermediate classroom, students use a *P-E-O Probe* to predict and explain whether the mass of an ice cube in a sealed ziplock bag will increase, decrease, or stay the same after it melts. Using the *Human Scatterplots* technique, the teacher quickly sees that students differ in their predictions and confidence in their answer. She then provides them with an opportunity to discuss their prediction and the justification for it in small groups. The teacher listens carefully and notes the preconceptions students bring to the problem, particularly concepts they may have encountered previously, such as ice floating, that seem to muddle their understanding of the conservation-of-matter phenomenon of ice melting. After students have had an opportunity to explain their thinking about what would happen to the mass of the ice cube after it melts, the teacher provides an opportunity for students to test their ideas by observing and recording the mass of an ice cube in a sealed ziplock bag before and after it melts. She notices how some students are starting to rethink their ideas. The class then comes together to discuss and reconcile their findings with their original predictions and ideas. The students use *Scientists' Ideas Comparison* to examine their new thinking and compare how closely their current ideas match the scientific explanation.

In a middle school classroom, the teacher uses a *Familiar Phenomenon Probe* to uncover students' explanations for the phases of the moon. Using the *Sticky Bars* strategy to anonymously display students' ideas, the teacher and the class could instantly see that most students believed the phases of the moon were caused by the shadow of the Earth on the moon. Knowing that this would be a difficult idea to change, the teacher designs a lesson that involves the students in constructing a model to visually see for themselves how the position of the moon in relation to the Earth and the sun results in the different moon phases. After students experience the model, they revisit their original explanations and have an opportunity to revise them. The next day, students are given a task of researching lunar eclipses. They work in small groups with *Whiteboards* to illustrate and explain the difference between an eclipse and a new moon. Students share their *Whiteboard* ideas and get feedback from the class and teacher regarding the differences in representing the two sun-Earth-moon phenomena. At the end of the lesson, students use *I Used to Think . . . But Now I Know* to reflect on their original explanation for the phases of the moon and describe how comparing the model of an eclipse with the model of a moon phase helped them better understand both phenomena.

In a high school chemistry class, small groups of students are using *A & D Statements* to discuss and reconcile their different ideas about the claim, "The mass of an iron object decreases as it rusts." One student who agrees with the claim is trying to persuade her classmates to consider her idea that rust is like a mold that eats and breaks down iron, causing it to lose

mass. Another student who disagrees with the claim argues that the air is combined with the iron to make rust, which would add mass. Each group is trying to come up with a consensus idea and explanation to share with the class along with a method to test its idea. The teacher circulates among groups, probing further and encouraging argumentation. Students write a *Two-Minute Paper* at the end of class to share their thinking with the teacher and describe what they need to do next to test their ideas. The teacher uses this information to prepare for student inquiry the next day.

What do all of these classroom snapshots have in common? Each of these examples combines formative assessment techniques with instruction for a specific teaching and learning purpose. Often it is hard to tell whether a particular technique or strategy serves an instructional, assessment, or learning purpose since they are so intertwined. Students are learning while at the same time the teacher is gathering valuable information about their thinking that will inform instruction and provide feedback to students on their learning.

Each of these snapshots gives a brief glimpse into the different techniques teachers use to promote student thinking, uncover students' ideas, and use information about their students' progress in learning to improve their instruction. The teaching strategies in these snapshots are just a few of the 75 formative assessment classroom techniques (FACTs) described in Chapter 4, along with the underpinnings described in Chapters 1 through 3, that will help you understand and effectively use formative assessment. While you may be tempted to skip ahead and go directly to Chapter 4 to find FACTs you can use in your classroom, you are encouraged to read the preceding chapters. By having a firm knowledge base about the purposes and uses of formative assessment, as well as considerations for their use before you select a FACT, the image and implementation of formative assessment in your classroom will be sharper and more deliberately focused.

WHY USE FACTS?

Every day, science teachers are asking questions, listening carefully to students as they explain their ideas, observing students as they work in groups, examining student writing and drawings, and orchestrating classroom discourse that promotes the public sharing of ideas. These purposeful, planned, and often spontaneous teacher-to-student, student-to-teacher, and student-to-student verbal and written interactions involve a variety of assessment techniques. These techniques are used to engage students in thinking deeply about their ideas in science, uncover the preexisting ideas students bring to their learning that can be used as starting points to build upon during instruction, and help teachers and students determine how well individuals and the class are progressing toward developing scientific understanding.

Caveats

This FACT focuses on the negative, rather than the positive. Vary this strategy with *POMS—Point of Most Significance* to provide opportunities for students to identify the most significant part of a lesson or the parts of the lesson that were best understood.

Use With Other Disciplines

This FACT can also be used in mathematics, social studies, language arts, health, foreign languages, and performing arts.

My Notes

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#37: NO-HANDS QUESTIONING

Description

Students typically raise their hands when they wish to respond to a teacher's question. With *No-Hands Questioning*, students do not put their hands up to respond to a teacher's question. The teacher poses a question, practices wait time, and calls on students randomly. This FACT acknowledges that everyone needs to be ready to share his or her ideas. It reinforces the notion that everyone's response is important, not just the students who show they know the answer by raising their hand (Black et al., 2003).

How This FACT Promotes Student Learning

No-Hands Questioning is used to stimulate thinking and provide an opportunity for all students to be asked to share their thinking, not just students who raise their hands. Often when a question is asked, hands will shoot up immediately. As a result, the students who take longer to think about an idea stop thinking once they see that others already have the answer. This FACT can increase students' engagement and motivation to think about their ideas and frame a quality response, since everyone in the class has an equal chance of being called upon to respond.

How This FACT Informs Instruction

This FACT, combined with wait time, is a way for teachers to encourage all students to be active participants in the learning process. Many students

have been habituated to raise their hands. *No-Hands Questioning* provides an opportunity for teachers to hear from a wide range of students in the class, not just those who raise their hands or opt out by not raising their hands. It is particularly useful when you need to learn what certain students in the class, who typically do not raise their hands, are thinking.

Design and Administration

Prepare a set of quality questions ahead of time (see the Appendix for source material on developing quality questions). Practice wait time both before and after posing a question. Call on a student by name after posing the full question and then extend the question further to probe for his or her ideas, giving the student additional time to think. In addition, the manner in which questions are asked by the teacher when a student is called upon indicates to the student that the teacher is interested in his or her thinking. The following example shows how questions can be framed using this FACT:

Teacher: *"What do you think would happen if all the microbes on Earth suddenly died?"*

Teacher uses wait time.

"Jana, what ideas do you have about this?"

Jana: *"Well, I think it would be a good thing because there would be fewer diseases and less people would die."*

Teacher uses wait time after Jana's response.

Teacher: *"What do others think about Jana's idea?"*

Teacher pauses for wait time.

"Tyrone, what are your thoughts?"

Tyrone: *"I think it would be good that people wouldn't get as many diseases, but I think it would be bad for the Earth because there wouldn't be anything to break down all the things that die so they would just build up."*

Teacher uses wait time.

Teacher: *"Would someone like to add to Tyrone's idea or share a different thought?"*

Teacher pauses.

"Petra, what are you thinking about right now?"

Share the reason for using this FACT with students so they understand that it is intended to help them think, provide an opportunity for any student to be heard, and share various ideas that students may have. Make