

How do we know they know it?

Formative Assessment Techniques
Presented by Susan German

Objective

- After drawing a scenario card from a pile of cards, teachers will design a quick formative assessment including the technique for delivery that they will demonstrate with complete class participation for peer evaluation of their performance.

Why is formative assessment important?


- How many of us teach the lessons in the unit, think the students understand the material, give the test only to have several students fail?
- Or
- What about when you mention prior learning to the students and they reply, “Oh, I forgot that stuff after the test.”

Types of Assessment

- Diagnostic: To identify preconceptions, lines of reasoning, and learning difficulties
- Formative: To inform instruction and provide feedback to students on their learning
- To measure and document the extent to which students have achieved a learning target.


Which form of assessment is more important?

- There should be a balanced approach to assessment. A great deal of emphasis is placed on Summative assessment (MAP Tests), but research has shown that students learn best through a balanced approach.




Research that supports the use of FACTS-from *How People Learn: Brain, Mind, Experience, and School*

Principle 1: If their initial understanding is not engaged, they may fail to grasp new concepts and information presented in the classroom, or they may learn them for purposes of a test but revert to their preconceptions.



Research that supports the use of FACTS-from
*How People Learn: Brain, Mind, Experience, and
School*

Principle 2: To develop competence in an area of inquiry, students must (a) have a deep foundation of factual knowledge, (b) understand facts and ideas in the context of a conceptual framework, and (c) organize knowledge in ways that facilitate retrieval and application.



Research that supports the use of FACTS-from
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Principle 3: A “metacognitive” approach to instruction can help students learn to take control of their own learning by defining learning goals and monitoring their progress in achieving them.



Just because you keep weighing a pig

..... Doesn't mean the pig will gain weight.

Assessment is formative if and only if the information collected from the assessment is used to inform instruction.

How do I know which formative assessment technique to use?

Depending on what you want to accomplish in your classroom.

- Elicit and identify Preconceptions
- Engage and Motivate Students
- Activate Thinking and Promote Metacognition
- Provide Stimuli for scientific Discussion
- Initiate Scientific Inquiry and Idea Exploration
- Formal Concept Development and Transfer
- Improve Questioning and Responses
- Provide Feedback
- Peer and Self-Assessment
- Reflection

References for Misconceptions

- <http://www.amasci.com/miscon/opphys.html>
- <http://books.google.com/books?id=YJP9InlgpKEC>
- <http://www.newyorkscienceteacher.com/sci/miscon/common-miscon/index.php>
- <http://www.emints.org/ethemes/resources/S00001766.shtml>



Elicit and Identify Preconceptions

A&D Statements

1. The phases of the moon are caused by the shadow of the Earth on the Moon's surface. How can you find out?

_____ Agree

_____ Disagree

_____ It depends

_____ Not Sure

My thoughts

A&D Statement (Math)

Multiplication always
increases a number... is
that really so?

How can you find out?

_____ Agree

_____ Disagree

_____ It depends

_____ Not Sure

Agreement Circles

Science Examples

- Energy is a type of fuel.
- Heat rises.
- Energy cannot be created or destroyed.

Math Examples

- 3 divide $1/4$ is same as 3 divide 4.
- As $1 \times 1 = 1$, then $0.1 \times 0.1 = 0.1$.



Engage and Motivate Students

Odd One Out

- Which is the odd one?

Weight

Density

Length

Color

- Why is it the odd one out?

Odd One Out (Math)

- Which is the odd one out?

Length

Volume

Temperature

Mass

- Why is it the odd one out?

Pass the Question

- (Science) What kinds of things do you think affect whether an object floats or sinks in water? Are there things you can do to change how an object floats or sinks?
- (Math) What is the maximum area of a shape that has a perimeter of 30 units?



Activate Thinking and Promote Metacognition

Card Sorts

Things That Are Animals	Things That Are Not Animals
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Ant	Horse	Fish
Human	Monkey	Worm
Giraffe	Snail	Lizard
Spider	Flower	Crab
Butterfly	Tree	Shark
Whale	Toad	Snake
Kitten	Octopus	Mushroom
Hummingbird	Caterpillar	Mouse

Card Sorts (Math)

Rational Numbers	Irrational Numbers
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Pi	Golden Ratio	2
3.75	15/7	6 4/5
-8	Sqrt(2)	-0.54



Focused Listing or “We already did this in --- grade”

Refraction of Light

- 1.
- 2.
- 3.

Area

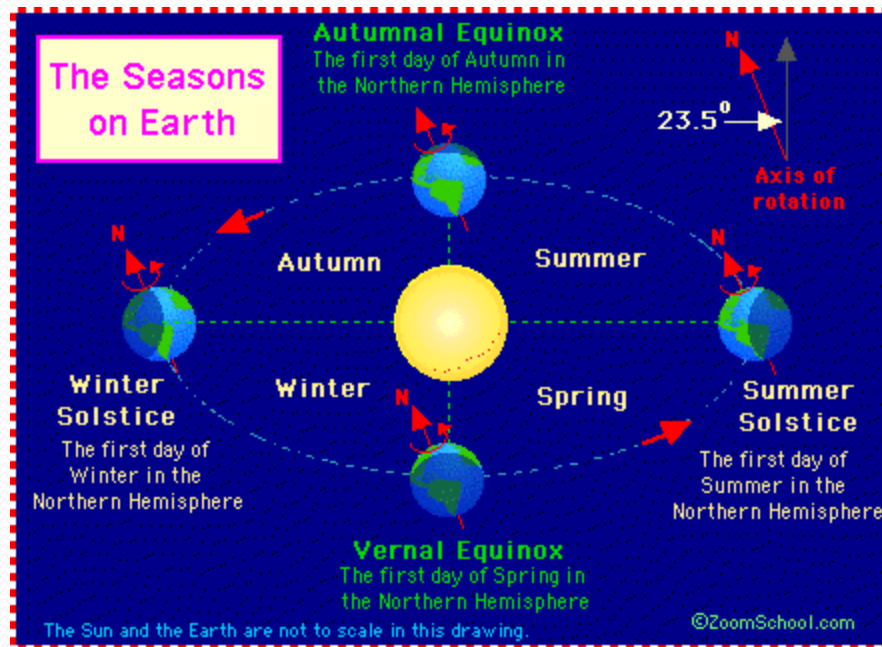
- 1.
- 2.
- 3.



Provide Stimuli for Scientific Discussion

Representation Analysis

Source: Enchanted Learning



Think-Pair-Do-Share

We have been working with force and motion for a while. With a partner, design a paper model that will have a marble roll down the slowest. You will be given a marble, 10 sheets of paper and 1 m of tape to use. Time will run from the start of the marble until the marble either stops moving or completes the model.



Initiate Scientific Inquiry and Idea Exploration



Predict Explain Observe



Justified Lists



Formal Concept Development and Transfer



Fruyer Model

Concept Card Mapping

Ice	Water	Vapor	Solid
Liquid	Gas	Plasma	Energy
Molecules	Vibrate	Move Freely	Held Loosely
Heat	Temperature	Evaporation	Condensation



Improve Questioning and Responses

Fact First Questioning

- Glucose is a form of food for plants. Why is glucose considered a food for plants?
- Density is a characteristic of matter. Why is density considered a characteristic property?
- Sandstone is a sedimentary rock. Why is sandstone considered a sedimentary rock?

Juicy Question

Why could Jupiter be classified as a failed star?

What would the possible environmental impact of ice being denser than water?

No Math Example



Provide Feedback

Muddiest Point

Today's lesson was about how the photoperiod changes with latitude. What has been the muddiest point so far in the lesson for you. Please take a few minutes to jot down any ideas or parts of the lesson that were confusing or difficult for you to understand, so I can address them in class tomorrow.



A Picture Tells a Thousand Words

Take a picture of students engaged in an inquiry activity. After the activity....give the student a copy of the picture and ask what they were doing and learning during the “inquiry moment”. Students write a description under the photograph.



Peer and Self-Assessment

Learning Goals Inventory

Learning Goal:

- What do you think this learning goal is about?
- List any facts, concepts, or ideas you are familiar with related to this learning goal:
- List any terminology you know of that relates to this goal:
- List any experiences you have had (in or outside of school) that may have helped you learn about ideas in this learning goal:

Missed Conception

Missed Conception: “The reason we have seasons is that, as the Earth revolves around the sun, it is closer to the sun in the summertime; therefore, it is warmer in summer and colder in winter.”

1. Why do you think some people have this idea about the reason for seasons?
2. What things could you do to help someone understand the scientific explanation for seasons? How would this help someone give up his or her original idea in favor of the scientific one?
3. Did you ever have a similar Missed Conception at the beginning of this unit or sometime during your life? Do you think you might still hold on to your previous ideas or parts of them? How and/or why has your thinking changed or not changed?



Reflection

I think-We think

Two column sheet of paper. (I think) students record their ideas prior to group discussion. (We think) students record the ideas that came from group discussion.



I used to think...but now I know

Students are asked to complete the statement at the end of instruction.

On to the practice assignment

- Select a card from the stack as the instructor walks by.
- The card has a science or math scenario described.
- Using one of the techniques that we have practiced in class, design a short formative assessment that can be given to the rest of the class.
- The class, after participating in the assessment, will then offer suggestions to help improve your assessment.

The final work

- For teachers K-5, please group yourself by grade level.
- For teachers 6-12, please group yourself by discipline.
- Within your groups, choose an objective from your curriculum and design a lesson that includes a formative assessment and technique.
- If time permits, we will have each group be in charge of the class to present their lesson. If time does not permit, we will put the lessons on chart paper to have gallery walk. There will be post-its available for those who wish to add comments or questions.