Interactive Session

How well do assessment tasks align with standards?
The Importance of Goals
Science and Mathematics Assessments

For assessments to be helpful, they must accurately measure what you want your students to learn - your standards.
Alignment

What does it mean?

What constitutes evidence for it?

How does one go about ensuring it for a task or set of tasks?
Learning Goal on Conservation of Matter

No matter how substances within a closed system interact with one another, or how they combine or break apart, the total mass of the system remains the same. The idea of atoms explains the conservation of matter: If the number of atoms stays the same no matter how they are rearranged, then their total mass stays the same. *Benchmarks, 4D 6-8, #7*
Common Student Difficulties
Conservation of Matter

- Interpreting chemical changes in terms of disappearance and appearance of substances (Driver et al., 1994)
- Thinking gases aren’t substances and hence not considering their mass (AAAS, 1993)
- Confusing weight with density (AAAS, 1993)
Sample Task

Balance the following equation:

\[ \text{BaCl}_2 + \text{Na}_2\text{SO}_4 \rightarrow \text{BaSO}_4 + \text{NaCl} \]

Necessity and Sufficiency

Given this task…

• Is the example learning goal *necessary* to respond correctly? If so, is all of it or only part of it necessary?

• Is the example learning goal *sufficient* to respond correctly? If not, what other knowledge is needed?
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Task: Moldy Bread

Betsy placed some bread in a plastic bag. Nothing could get in or get out. After two weeks, she noticed mold growing on the bread.

Before

After Two Weeks

Betsy weighed the bag with the bread before and after mold started growing. Did the bag, with the moldy bread, weigh the same, more, or less than it did before the mold started growing? Fill in the oval next to your answer below.

same  more  less

In a few sentences explain your answer.
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Goals-Based Assessment

“Commercially available norm-referenced tests would not meet the legislation’s criteria for quality, standards-based tests. We don’t want these off-the-shelf tests.”

Senator Edward Kennedy

ED, February 14, 2002
Alignment

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Alignment and Policy Implications in Large-Scale Assessments

- **Virginia Malone** - Commercial Test Developer’s Perspective

- **Ed Smith** - Michigan’s Assessment Development

- **David Potter** - Assessment Alignment Issues
CONSERVATION OF MATTER

The idea of atoms explains the conservation of matter: if the number of atoms stays the same no matter how the same atoms are rearranged, then their total mass stays the same. 4D/M7

In chemical reactions, the atoms of original substances do not appear or disappear.

No matter how substances within a closed system interact... the total mass of the system remains the same. 4D/M7...

Air is a substance that surrounds us, takes up space, [and has mass.] 4B/E4...

Students do not believe that gas is a substance.

When a new material is made by combining two or more materials, it has properties that are different from the original materials. 4D/E4...

The properties of a material may be different from the properties of its parts. A change in an object may not mean that its parts have changed.

Students may believe that when something happens to an object (e.g., it expands), the same thing happens to the atoms making up that object.

Most substances can exist as a solid, liquid, or gas depending on temperature. (SFAA, p.47)

Students have problems grasping the idea that weight is conserved in reactions in which a gas is absorbed or evolved, especially when the gas is invisible.

Substances may move from place to place, but they never appear out of nowhere and never just disappear. (BSL, p. 119)

Phenomena Domains

1) Closed vs. Open Systems,
2) Appearance and Disappearance,
3) States of Matter (Solids, Liquids, Visible and Invisible Gas)
4) Chemical and Physical Changes,
5) Different Scientific Disciplines (Life, Physical, Earthspace, Technology)