What Is Alignment and Why Is It Important?

Overview:

In this session, participants explore the connection between curriculum, standards, and assessment. First they participate in a short hands-on chemistry experience. They analyze three ways a teacher might assess understandings that students have gained from the experience. Then they consider how this relates to science standards. These experiences and a reflective discussion lead to an understanding of the importance of aligning curriculum, standards, and assessment—and the importance of providing students with authentic opportunities to learn standards-related content. This session also can help participants further consider the pros and cons of "teaching to the test."

Use:

This would be an excellent follow-up to the *Assessing Standards* activity. It is ideal for participants who want to explore the issues in more depth.

Key Concepts Addressed from Public Understanding Framework:

Accountability
Are Tests Accurate?

Time Frame: 50-60 minutes

Chemistry "Lesson" (15 minutes)
Chemistry Assessments (15-20 minutes)
Alignment to Standards (15-20 minutes)
Teacher's Choices (5 minutes)

What You Need:

For each group of 4-6 participants:

- o 1 set of materials for the chemistry "lesson"
  - 2-3 clear plastic cups (8 oz. "Solo" brand cups work well)
  - 4-6 strips of paper from coffee filters (strips should be about 3/4" wide and as long as the cup's height—usually about 3-3 1/2 inches long)
  - 2-3 popsicle sticks (or coffee stirrers or pencils)
- o 1 copy Chemistry Chromatography Quiz
- o 1 copy Chemistry Open-Ended Test
- o 1 copy Chemistry Constructed Response Test
- o 1 copy California State 5th Grade Physical Science Standards

For the whole class:

- o shared materials for the chemistry "lesson"
  - 2 black felt-tip pens of different brands (both non-permanent)
  - a couple of pencils
  - 1 pitcher of water
  - 1 roll of masking tape
- o transparent tape

For the presenter:

- o 1 each of the following 6 overhead transparencies (masters)
  - 1. "Reflection Questions" transparency
  - 2. "Chemistry Quiz" transparency
  - 3. "Chemistry Open-ended Prompt" transparency
  - 4. "Chemistry Constructed Response Test" transparency
  - 5. "Curriculum/Instruction, Assessment, Standards" transparency
  - 6. "California State 5th Grade Physical Science Standards" transparency
- o overhead projector
- o extension cord (optional)

Getting Ready:

Before the Day of the Workshop:

1. **Acquire Materials for Chemistry Lesson.** Acquire materials—cups, coffee filters, pens, pencils, masking tape, water pitcher.

2. **Prepare Coffee Filter Strips.** Cut coffee filters so you have approximately as many strips as there are participants.

3. **Label Pens.** Use a tiny square of paper and transparent tape to label one black felt tip pen "#1" and the other "#2".

4. **Make Overhead Transparencies.** Make the overhead transparencies. ***Note:*** *The second, third, fourth, and fifth overheads are the same as the participant handouts. You will need one copy of them for overhead use, and as many copies of them as needed for participants.*

5. **Make Copies of Handouts for Participants.** For each pair of participants, make:
   - 1 copy each of the three different chemistry tests (masters)
   - 1 copy of the California State Physical Science Standards (master).

   Note: The California example should serve to make the general point about alignment. However, you may want to customize this activity to your home state. In that case, scan your state's science standards for the grade level where "separating mixtures" and other chemistry concepts first appear (usually between grades 3 and 6). Copy that description instead.

Immediately Before the Workshop:

1. **Set up the room.** Arrange the room so that groups of 4-6 participants can sit at a table together. If you are in a classroom, move desks together to make "tables." Tables should be oriented so that all of the table groups can join a large group discussion, and see what's projected on the overhead.

2. **Set up overhead projector.** Set up overhead projector at the front of the room near where you will stand.

3. **Have overhead transparencies on hand.** Place the six overhead transparencies (in order) next to the overhead projector.

4. **Set up shared materials station.** Fill the pitcher with water and place it, the black pens, the paper strips, and the masking tape in a central location. A representative from each group of 4-6 participants will visit this station to get water, tape, and paper and to use the pens and pencils.

5. **Have remaining materials on hand.** Have the cups and popsicle sticks on hand to distribute.

Chemistry Lesson

1. **Introduce Purpose.** In order to explore how curriculum, standards and assessment are connected, explain that you'll guide them in a brief chemistry activity. It's not necessary that they learn the chemistry in the activity, but rather that they see how it connects (or doesn't) with standards and assessments.

2. **Introduce Chemistry Activity.** Tell them they will be comparing the ink in two black felt pens in order to identify the pen used to forge a document.

3. **Show Chromatography Test.** Demonstrate and tell how they will use a method called chromatography (crow-ma-tog-rah-fee) to test the two inks:

   - **Make a Test Strip for Pen #1.** Go to the central material station to draw a line with Pen #1 across a strip of coffee filter paper. Draw the line **2 finger-widths** from the bottom. Use a pencil to write #1 at the top of the strip.

   - **Make a Test Strip for Pen #2.** Do the same with Pen #2 on a different test strip.

- **Pour Water in Cup.** Pour **1 finger-width** of water into the bottom of both plastic cups.
- **Suspend Test Strip in Water.** Use a piece of tape and a popsicle stick to suspend the test strip so that the bottom of the strip hangs in the water without submerging the ink line. Do the same with the other test strip.
- **Observing the Tests.** Tell them their job is to watch what happens to the ink line as the water travels up through it. What will happen to the ink? The test is complete when the water stops traveling up the strip of paper.

4. **Conduct Chromatography Tests**. Make sure the participants know what they are to do, and then have them begin conducting tests on the ink of the two pens.

5. **Once the Tests Have Begun**. When the participants have set up the tests and are waiting for the water to travel up the paper, get their attention. Tell them that with students in the classroom, you'd take a couple of class sessions for them to test a lot of different pens, and to learn more about chromatography and what it can tell you about the properties of the different inks. Say you will briefly summarize the information that comes out of this 3-day experience.

6. **What Students Can Learn**.

   What's happening in the testing of the pens. Ink is usually a mixture of different pigments. Students discover that, as the water travels through the ink, it causes the ink to separate into its parts—pigments. Pretty soon you should be seeing lines of color moving up the paper. Each color is a different pigment. Each pigment travels up the paper at a different rate. Those pigments are all mixed together to make the black ink. Different black inks have different mixtures of pigments. By seeing what pigments are in a specific ink, you can figure out whether that ink is similar to or different from another black ink by comparing the results of your chromatography tests. Chromatography is the name of the process used to separate mixtures into their component parts.

   Understanding the chromatography system. Chromatography can be seen as a system. You have the **test substance** (in this case it is ink). You have the **solvent** (in this case it is water). And you have the **medium** (in this case it is paper). By using different solvents, or different media, it enables you to separate different kinds of mixtures—**test substances**. Students explore this system, by trying different solvents, media, and test substances.

How chromatography works. Students then go on to learn how chromatography works at the level of molecules. They learn that different pigment molecules travel faster or slower up the paper depending on their size, shape, attraction to the paper (medium), and attraction to the solvent (water).

7. **Conclude Chromatography Tests**. By now, participants' chromatography tests will be complete. Is the ink in the two pens the same or different? How can they tell? Have them look at the different pigments that separated. Ask them to bring the materials back to the materials station and return to their seats.

Chemistry Assessments

1. **Pairs Analyze 3 Different Chemistry Tests.** Distribute three different chemistry tests to each pair of participants. Ask them to look at them together so they can understand what students are asked to do.

2. **Pairs Reflect of Connection of Experience to Test**. After most pairs have looked at the three tests, get the group's attention. Show transparency #1 with the following reflection questions and ask them to talk in their pairs about each point:

1) Look at each test. How well is it aligned to the Chemistry (Chromatography) lesson? Does the curriculum give students the opportunity to learn what is on the test?

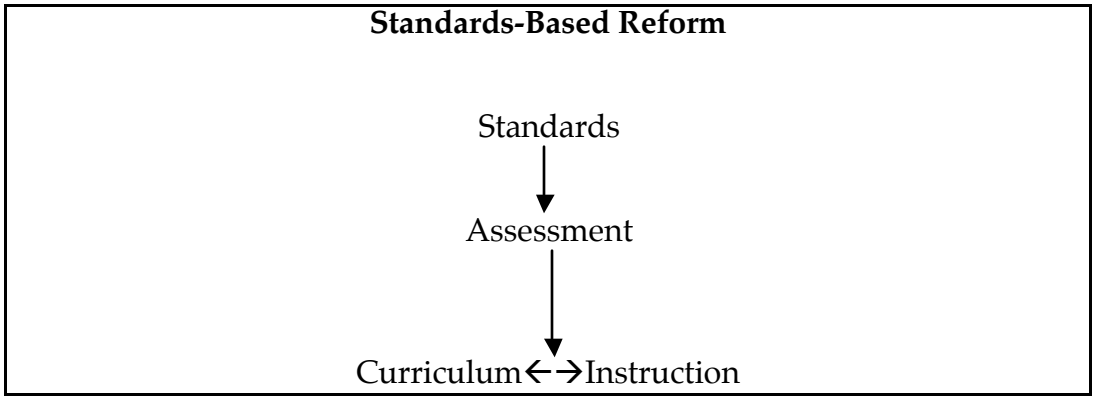
2) Consider the impact of not completing the full lesson. What are other possible reasons why a curriculum can be aligned to a test, but students might still not have an authentic opportunity to learn?

3. **Whole Group Debrief.** After most pairs have discussed both questions, get the group's attention. Lead a discussion about the two reflection discussions. Show overheads #2, #3, and #4 as appropriate to the discussion.

   - **Alignment.** Ask for pairs to share some of their thoughts about the first question regarding alignment. Which tests seem more closely aligned to the lesson? After groups have shared their thoughts, point out that while classroom tests are often aligned to lessons; standards-based reform would have lessons aligned to tests. Talk about the time and expense of realigning curriculum to tests and that this is something few districts have invested in.

   - **Opportunity to Learn.** Ask for pairs to share some of their thoughts about the second question regarding opportunity to learn. Ask what reasons can interfere with students opportunity to learn. If they are not mentioned, add: teachers not finishing a curriculum, or not even teaching it; student absences; student difficulties related to understanding oral and written language.

4. **Show Curriculum/Instruction, Assessment, Standards Overhead.** Show overhead #5 depicting the basic relationship between standards, assessment, and curriculum/instruction. Emphasize the importance that standards, assessment and curriculum be aligned if standards-based reform is to be effective.



Alignment to Standards

1. **Distribute 5th Grade Physical Science Standards** and show overhead (of the same).

California State 5th Grade Physical Science Standards

• Elements and their combinations account for all the varied types of matter in the world. As a basis for understanding this concept, students know:

a. during chemical reactions, the atoms in the reactants rearrange to form products with different properties.
b. all matter is made of atoms, which may combine to form molecules.
c. metals are a group of substances that have shared properties, such as, electrical and thermal conductivity. Some metals, such as aluminum (Al), iron (Fe), nickel (Ni), copper (Cu), silver (Ag), gold (Au), are pure elements while others, such as steel and brass, are composed of a combination of elemental metals.
d. each element is made of one kind of atom. These elements are organized in the Periodic Table by their chemical properties.
e. scientists have developed instruments that can create images of atoms and molecules showing that they are discrete and occur in well ordered arrays.
f. differences in chemical and physical properties of substances are used to separate mixtures and identify compounds.
g. properties of solid, liquid, and gaseous substances, such as sugar (C6H12O6), water (H2O), helium (He), oxygen (O2), nitrogen (N2),and carbon dioxide (CO2).
h. living organisms and most materials are composed of just a few elements.
i. common properties of salts, such as sodium chloride (NaCl).

Ask participants if they can figure out which part of the standard, if any, the assessments are aligned to.

2. **Alignment of Assessment to Standards.** Is it possible for teachers to be teaching standards-aligned curriculum and still have students score poorly on the test? Point out that as recently as 1999, an independent group determined that not a single state had tests that were well aligned to state standards for math and literacy. That is slowly changing, but until a better alignment between assessment and standards exist, it's a hard target to hit.

3. **Teaching to the Test.** Even when tests are aligned to standards, many tests stress disconnected knowledge and facts that don't relate to higher thinking skills. These shallow and often broad measures of learning lead to teachers teaching to the test, skimming topics in a surface way, and sometimes effectively "dumbing down" the curriculum. Some believe more pressure on the need for test reform would help improve this situation.

Teachers' Choices

1. **Ideal vs. Real World.** In theory, standards-based reform is brilliant. And in an ideal world, one could imagine how it could work effectively and on a large scale. But in the real world, currently tests are not closely aligned with standards. And few districts have the funding to do the kind of curriculum alignment that is needed. That leaves the system unaligned and in disarray. Until there are good large-scale tests, aligned to quality standards, and that probe for more than shallow or surface understanding, standards-based reform will not result in the changes everyone hopes it will.

2. **What Should a Teacher Choose?** Conclude by asking participants to consider the hard choices teachers must make. Should teachers align their curriculum to standards even when the tests on which they are measured are not well aligned? Should teachers abandon their educational judgment about doing a good and in-depth job of teaching in order to have enough time to cover what are sometimes a huge number of test items that are part of an overly broad and shallow coverage of the subject matter? Where do we go from here?

Reflection Questions

1) Look at each test.

   How well is it aligned to the Chemistry (Chromatography) lesson?

   Does the curriculum give students the chance to learn what is on the test?

2) Consider the impact of not completing the full lesson.

   What are other possible reasons why a curriculum can be aligned to a test, but students still might not have an authentic opportunity to learn?

Overhead #1

Chemistry Chromatography Quiz

1. What colors appeared on the two test strips after placing them in the solvent?

2.What process caused the solvent to move up into the chromatography paper?

3.Name the parts of the system that makes up the chromatography test.

4.Tell three things which can affect where the pigments travel in the chromatography test.

Overhead #2/Participant Handout

Chemistry Open-Ended Test

Using your "microscope eyes" describe how the pigment molecules are separated in the chromatography paper.

Overhead #3/Participant Handout

Chemistry
Constructed Response Test

Hanna and Alex are working to identify test solutions in their science class. All three samples are clear and colorless. They have added a pH indicator to each solution to determine whether they are acids, bases, or neutrals. This indicator turns red with acids, yellow with neutrals, and green with bases.

These are their results:

Solution A – red
Solution B – green
Solution C – yellow/green

What conclusions (if any) can be drawn from their data?

Overhead #4/Participant Handout

California State Physical Science Standard for Grade 5

• Elements and their combinations account for all the varied types of matter in the world. As a basis for understanding this concept, students know:

a. during chemical reactions, the atoms in the reactants rearrange to form products with different properties.

b. all matter is made of atoms, which may combine to form molecules.

c. metals are a group of substances that have shared properties, such as, electrical and thermal conductivity. Some metals, such as aluminum (Al), iron (Fe), nickel (Ni), copper (Cu), silver (Ag), gold (Au), are pure elements while others, such as steel and brass, are composed of a combination of elemental metals.

d. each element is made of one kind of atom. These elements are organized in the Periodic Table by their chemical properties.

e. scientists have developed instruments that can create images of atoms and molecules showing that they are discrete and occur in well ordered arrays.

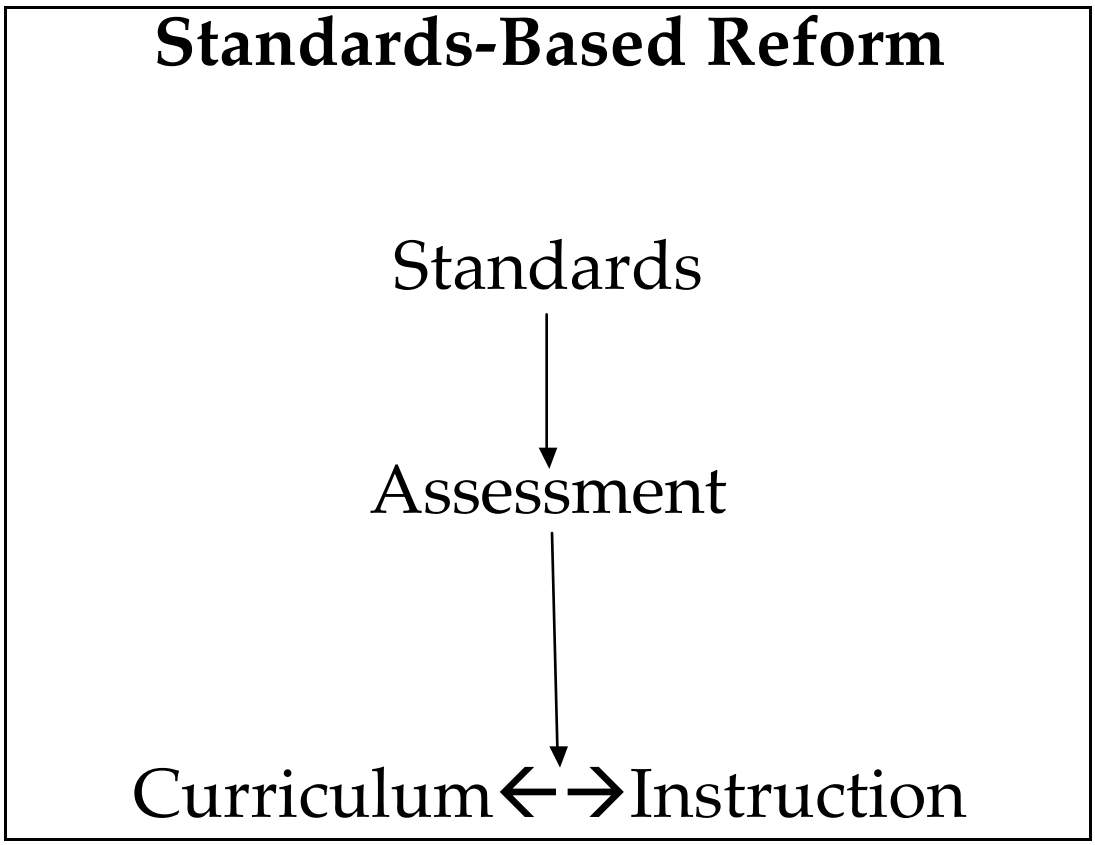
f. differences in chemical and physical properties of substances are used to separate mixtures and identify compounds.

g. properties of solid, liquid, and gaseous substances, such as sugar ($C_6H_{12}O_6$), water (H_2O), helium (He), oxygen (O_2), nitrogen (N_2),and carbon dioxide (CO_2).

h. living organisms and most materials are composed of just a few elements.

i. common properties of salts, such as sodium chloride (NaCl).

Overhead #5/Participant Handout



Overhead #6

