

Differentiating Instruction in Middle School Physical Sciences

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 March 29, 2012

Pre-assessment

- Please answer the following two questions on an index card. Your answers will be used to assign you to a collaborative group for today's activity.

1. When I put together electronics or conduct an investigation or other hands-on procedure, I prefer to:
 - A. Be given a general sense what to do, and then figure it out myself
 - B. Be given fairly detailed written instructions and then work at my own pace
 - C. Be given fairly detailed written instructions and have someone available to coach me through it.
2. I think that my ability to design a controlled investigation is:
 - a. Strong
 - b. Good, but maybe a little rusty
 - c. Very rusty

Slides will be posted

- Sepuplhs.org/news

Presentation Overview

- Brief discussion of differentiated instruction (DI)
- Conduct a differentiated hands-on, inquiry-based lesson
- Discuss the principles of differentiation illustrated

What is DI?

- It is based on the observation that students differ in readiness, interests, and learning profile
- It is seen as a way to equitably meet the learning needs of all students in the classroom (Costello, 1994)
- It can be thought of as taking different roads to the same destination: It provides all students access to core concepts in a good curriculum

Differentiated Instruction

- Respects students' differences
- Includes plans that flexibly anticipate and respond to those learning differences
- Requires ongoing formative assessment so that all students are both
 - able to succeed
 - challenged

DI in the science classroom

- What student needs do you hope to address by differentiated instruction?
- We will model a lesson, and then discuss:
 - What additional modifications might you need to make in the basic lesson for your students?

Chemical Batteries: Learning Goals

- 1) A battery converts stored (potential) chemical energy into physical energy. The energy produced is related to the specific chemicals and other properties of the battery. (NSES Physical Science: Properties and Changes of Properties in Matter, and Transfer of Energy)
- 2) Students design and conduct a scientific investigation. (Inquiry: Abilities to do Inquiry)

As you plan for differentiation, think about . . .

3 Differentiation elements

- Content
- Process
- Products

3 Student characteristics

- Readiness
- Interest
- Learning profile

Safety

- Wear goggles while doing the activity
- Avoid touching eyes or mouth
- Lab materials include:
 - Hydrogen peroxide (household)
 - NaCl
 - Metals
 - Including magnesium—distribute only small amounts if you run the activity (magnesium is flammable)

First: Do the Activity

- All groups:
 - Activity Challenge: Design an investigation
 - Do the procedure provided at your table
 - Be prepared to report:
 - Your experimental design (write it out)
 - Your results and what you learned
 - Which students are likely to do best with your version of the activity
 - Additional modifications you might make for student success

DI Scoring Guide

- Students' work serves as your pre-assessment for the next investigation

What aspects of differentiation did we model?

3 Differentiation elements

- Content
- Process
- Products

3 Student characteristics

- Readiness
- Interest
- Learning profile

Essential principles of differentiation

- Good curriculum comes first
 - All tasks should be respectful of learner
 - When in doubt, teach up
 - Use flexible grouping
 - Become an assessment junkie
 - Grade for growth
- Tomlinson, C., & Strickland, C.A. (2005). *Differentiation in Practice*. Alexandria, VA: Association for Supervision and Curriculum Development.

“At the heart of teaching is an ability to step out of your own head. Teaching depends on what other people think, not what you think.”

From “Building A Better Teacher” by Elizabeth Green, the New York Times Magazine, March 7, 2010

Resources...

- Tomlinson, C. (1999). *The Differentiated Classroom: Responding to the Needs of All Learners*. Alexandria, VA: Association for Supervision and Curriculum Development.
- Tomlinson, C., & Strickland, C.A. (2005). *Differentiation in Practice*. Alexandria, VA: Association for Supervision and Curriculum Development.
- Tomlinson, C. & Allan, S. (2000). *Leadership for Differentiating Schools and Classrooms*. Alexandria, VA: Association for Supervision and Curriculum Development.
- Tomlinson, C. & McTighe, J. (2006). *Integrating Differentiated Instruction and Understanding by Design*. Alexandria, VA: Association for Supervision and Curriculum Development.

More Resources...

- *Cognitive development and learning in instructional contexts* (Byrnes, 1996)
- *Teaching for Diversity* (Garcia, 1998)
- *Teaching with the Brain in Mind* (Jensen, 1998)
- *One size fits few: The folly of educational standards* (Ohanian, 1999)