MODULE 3: WORKSHOP 9

REVIEWING THE CROSS-CUTTING CONCEPTS INVOLVED IN SOLVING PROBLEMS PLACED ON STUDENTS IN TASC ABOUT DISCIPLINARY CORE IDEAS POSED IN THE PHYSICAL SCIENCES, LIFE SCIENCES, EARTH & SPACE SCIENCES, AND SCIENTIFIC & ENGINEERING PRACTICES, WITH A FOCUS ON COHERENT INSTRUCTION INVOLVING QUESTIONING STRATEGIES IN PROBLEM-SOLVING CLASSROOMS.
Instructional Objectives / Goals

- Facilitators will engage in analysis of science crosscutting concepts.
- Facilitators will engage in a science practice.
- Facilitators will refresh content related to plate tectonics.
- Participants will become familiar with crosscutting concepts while engaging in science practices exploring content needed for the TASC.
- Participants will analyze earthquake patterns and compare how they relate to plate boundaries.
- Participants will engage in data analysis about earthquakes.
- Participants will refresh content related to plate tectonics.
Warm-Up / Review

• Teacher Reflection Sheet 1

• Individually now, facilitator will ask participants to go back to the table and from the importance column select one or two bulleted points they feel are important in science.

• Then, further explain why they are so.
Lesson Topic 1

From Contant, T. L. Framing Science. Methods for Teaching Science through Inquiry and Investigation (chapter 1).

• Handout 2: Table from http://www.pearsonhighered.com/assets/hip/us/hip_us_pearsonhighered/samplechapter/0133400794.pdf containing all crosscutting concepts with explanations and aligned activities.

• Video about the nature of science found at http://www.calacademy.org/explore-science/how-science-works to identify crosscutting concepts in use.

• Teacher Reflection Sheet to close the lesson activity.
Activity 1

• Activity 1: Participants will be given the Handout 2 containing a table with the description of all crosscutting concepts and suggested activities.

  – They will split into groups and will be asked to read the table and identify the crosscutting concept and the activity that, in their opinion, is best aligned with it. They will be asked to be ready to explain their choosing.

• In addition, they will have to come up with one additional activity that can relate to the crosscutting concept the group selected to work with. Activity 2: Facilitator will show the video How science works found at http://www.calacademy.org/explore-science/how-science-works and will pose the following questions:

• What crosscutting concept or concepts must the scientists engaged in to decide if the new spider was new to the world or not? (Structure and function, patterns)

• What does the video tell us about the nature of science and what are the implications for science instruction?
Questions to Answer

• What crosscutting concept or concepts must the scientists engaged in to decide if the new spider was new to the world or not? (Structure and function, patterns).
• What does the video tell us about the nature of science and what are the implications for science instruction?
Wrap Up

Teacher Reflection Sheet 1

• Individually now, facilitator will ask participants to go back to the table and from the importance column select one or two bulleted points they feel are important in science.

• Then, further explain why they are so.
Participants will be asked to go back to handout 2 and match the crosscutting concept that best fit this activity. Ideas will be discussed in the larger group.
Activity 2

• Activity 1: Participants are broken into groups and they are given a map of the Earth which shows the main tectonic plates and the direction which they are moving.
  – They will also receive a document with a description of the 3 types of plate boundaries: convergent, divergent, transform to support their answers.
  – Participants are asked to look at the map and to identify which type of tectonic plate boundaries they think exist in certain marked locations.
  – Facilitator will bring the groups together and will discuss answers. Facilitator will project the descriptions of the plate boundaries from the Power Point to aid the discussion.

• Activity 2: Participants are then given a list of geographical features on the earth which are directly caused by tectonic plate activity. Facilitator will ask participants to match up these geographical features with the differing types of plate boundaries.
  – The teacher will then reinforce this by pointing out the location of
    • The Himalayan Mountains (convergent)
    • The Great Rift Valley (divergent)
    • San Andreas Fault (transform)
Wrap Up

Re-read the copy from the Common Core Achieve textbook and find in the text the paragraph that explains what causes the plates to move. Paraphrase the paragraph.
Lesson Topic 3

• Activity 1: As a warm up, facilitator will ask participants to form into their groups and to answer to the following questions:
  – Questions will be projected on the Power Point and the Facilitator will call for answers.
    • How often do you think earthquakes happen?
    • Where do they happen?
    • When do you think the last earthquake occurred? Yesterday? Last week? A few years ago?
    • How often do you think there is an earthquake somewhere in the world?
    • Does every part of the world experience earthquakes?
• Activity 2: Groups will be given now a color copy of a global Earthquake map from http://earthquake.usgs.gov/earthquakes/world/seismicity_maps/world.pdf and will be asked to identify what patterns they notice in the map about seismic activity and how this pattern match their previous predictions or analyze if this pattern tells them something differently.
• Before calling groups for a larger discussion, facilitator will show the following alive map that shows seismic activity around the world and will be ask to conclude their observations. http://ds.iris.edu/seismon/index.phtml.
Activity 3

The focus of this professional development workshop will be to identify seismic patterns around the world, but also to explore the relationship between earthquakes and tectonic plate boundaries as well as analyze characteristics of all earthquakes utilizing visuals for discussion – as a way to generate lesson plans and activities for students in a classroom setting.
Questions to Answer

• What is the relationship between earthquakes and tectonic plate boundaries?

• Do you think all earthquakes have the same characteristics? What determines this? Use your maps to support your answers.
Wrap Up

• Reflection Assessment Sheet 2
• Name the science practice or practices that you think were used during this activity. Explain your reasoning.
• How was the crosscutting concept expressed in this lesson? Do you see opportunities for another one? Explain.
• To help participants remember the practices, point at the posters or bring the slide from the Power Point.
Lesson Topic 4

This lesson presumes that students are familiar with Earth’s structure, composition and The Theory of Plate Tectonics.
Activity 4

• Activity 1: In your groups, use your tables to access the USGS home page: http://earthquake.usgs.gov/earthquakes/?source=sitenav and locate a real time earthquake map.
  – Select at least 15 recent or current earthquakes and gather data such as location, magnitude and depth.

• Activity 2: Once your data is organized, proceed to answer the discussion questions that follow:
  – Describe what pattern you see while comparing the location of the earthquakes with the location of tectonic plate boundaries that you have in your maps.
Questions to Answer

Bring the class together to discuss participants’ results. Ask them what does the data tell us about Earth’s tectonic activity and what is the relationship between earthquake and plate boundary?
Wrap up

- Facilitator will have participants access the Annenberg Interactive Dynamic Earth found at http://www.learner.org/interactives/dynamicearth/plate.html.
- Participants will be asked to click on the Plate and Boundaries tab and review the material and then take the challenge at the bottom of the page.
- Facilitator will ask participants how they did in the challenge and quickly remind the students about the theory of plate tectonics.
Overall Wrap Up

• Participant will tell participants that most major geologic events occur at the boundaries between tectonic plates, where huge, massive pieces of the earth's crust interact. Each kind of plate boundary is associated with particular events, so if you know about the movements taking place at a plate boundary, you can often predict what's likely to occur there — volcanoes, earthquakes, mountains, trenches, etc.

• Facilitator will ask the participants if they see any benefit in analyzing seismic data to prevent hazards in areas with significant seismic risks.
Project Homework

What factors do you think should be considered when developing policies to protect people living in areas that are at risk from natural hazard?
Contact Information

Queens Borough Public Library
89-11 Merrick Blvd.
Jamaica, NY 11432
TASC Transition Curriculum: www.queenslibrary.org/tasc-transition

Diosdado G. Gica, EdD
Director of Learning and Literacy
E-mail address: alpref@queenslibrary.org
Web: www.queenslibrary.org/adultlearning

Tara Lannen-Stanton
Assistant Director, Job & Business Academy
E-mail address: tstanton@queenslibrary.org

Nikeisha Smothers
Program Standards & Performance Manager, Adult Learner Program
E-mail address: nsmothers@queenslibrary.org

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