Professional Development Situation: Training

Skill Focus: Modeling Science Practices

Time Required: 85 minutes

USING MODELS

Participants will demonstrate the importance of models when trying to answer questions and draw conclusions.

Agenda

Welcome and Introductions—15 minutes

See the Skill in Action—10 minutes

- Testing Predictions Using Models video-based learning module

Hands-On Learning (40 min)

- Crayon Rock Cycle

Debrief—15 minutes

Conclusion—2 minutes

Materials

- Computer with Internet connection
- Projector and speakers
- Flip chart paper
- Markers
- Pens/pencils
- Paper for name tents
- Materials for Crayon Rock Cycle (per each group)
    - Two different colored crayons – can be new or used
    - Very hot water
    - One container – small Tupperware or recycled plastic bowls or measuring cups
    - Aluminum foil or foil cupcake liners
    - Scrapping device – plastic knife, popsicle stick, etc.
- Testing Predictions Using Models video-based learning module

- One copy of Crayon Rock Cycle – Instructions/Observations per person

Before the Session

- **Read this training guide** to become familiar with the content and allow time to personalize the activities to best suit your presentation style. Watch all videos and read informational materials.
    - *Italics indicate text that can be read aloud or emailed to participants.*
- Send reminder email about the training. Determine if any participants require accommodations (sight; hearing; etc.).
    - *The next professional development opportunity to enhance our STEM skills will be on DATE at TIME at LOCATION. Our focus for this session will be "Modeling Science Practices." Let me know if you require any accommodations to participate in the training. I am happy to answer any questions you have and look forward to seeing you at the workshop. I can be reached at CONTACT INFO.*
- Gather all materials needed for the training.
- Develop a list of possible questions participants might have during the training. Create potential responses to be explored through informal conversation. Review any key terms or ideas that may be unclear.
- On the day of the training, test the audio and video equipment.

Training Outline

Welcome and Introductions (15 min)

- Greet participants as they arrive. Make sure everyone feels welcome and comfortable.
- Introduce yourself and the focus of the session: Modeling science practices.
- Ensure participants are aware of the locations of restrooms facilities, refreshments, etc.
- Pass out paper and pens for participants to make name tents.
    - *On one side of the name tent, write your name and program name, and on the other side write down seven words in sequence that describe your life. You will have 2 minutes to write and only 2 minutes to explain how these words describe your life.*
- Encourage participants to share their name tents with each other in small groups or ask participants to walk around the room with them to do introductions. Give them only two minutes to explain to each person what the words respresent in participants' lives.

See the Skill in Action (10 min)

- Watch the overview video under step 1 of the Testing Predictions Using Models video-based learning module.
- Cue up the skill video under step 3 of the Testing Predictions Using Models video-based learning module.
    - *Throughout the video, watch how the youth use playing cards to show what is happening in the grocery store lines. Also, listen for cues as to how using a model helps youth test predictions about the grocery lines.*
    - *As you watch the video, think about the following questions:*
        - *What do the deck of cards represent?*
        - *What are they testing?*
        - *What kinds of limits do models have?*
- Watch the video.
- As a group, discuss the questions above.
- Watch the video again if needed.

Hands-on Learning (40 min)

- Introduce the Crayon Rock Cycle with the following script:
    - *Is it possible for us to observe rocks actually be created? There are unique conditions that need to take place or need to be met in order for the three different types of rocks to form. Today we will use crayons to model how rocks are formed over a long period of time. However, we will be able to observe the process of forming rocks in a matter of minutes!*
    - *First, we will need to break into groups of two or three. Each group will receive two or three different colors of crayons and an instruction/observation sheet. Follow the instructions and make sure to answer the questions as you go along. You may choose to start with any of the three processes. You are not required to go in order.*
- Make sure participants take precautions when using the hot water depending on how hot you get your water.
- Each rock model should take 20-25 minutes. If you have more time, each group can create all three rock formations and compare the three models to each other.
- After each group has created their model, discuss the observation questions as a group, asking small groups to share their responses. (You can also show them a picture of each fully formed rock to compare to the model they created.)

Debrief (15 min)

- Ask the entire group how these models helped them learn about the rock cycle and three types of rocks. Have a participant chart the groups' responses.
    - *How did taking the time to work with these crayon models help with your conclusions about the rock cycle?*
    - *How might using this modeling activity improve your understanding of the rock cycle over another teaching technique?*
    - *What limits does this model have when teaching the types of rocks and the rock cycle?*
- In small groups, brainstorm some other common models used in teaching large scale ideas. Have another participant chart the groups' responses.
    - *What are some other models that you use within your lessons?*
- Put the two charts next to each other. Ask participants to get into small groups for the next discussion.
    - *What models are you currently using in STEM activities? How could you use those models differently to increase understanding of science and engineering processes?* (Example: a common volcano eruption model is the combining of baking soda and vinegar. While this is a cool effect and may get them interested in learning more, how can you use this model to help explain the forces that cause volcanoes to erupt?).
    - *What are some other lessons you think you could integrate models into so that youth will develop a better understanding?*

Conclusion (2 min)

- *Thank you for coming to the session today. We learned how models are effective tools for helping youth test predictions, answer questions, and draw conclusions. Models are especially helpful when we are exploring phenomena that we can't directly observe or it wouldn't be logistically possible to observe directly. Following the session, I will share the notes from our charts that we created today. You can also take the Crayon Rock Cycle activity with you to use in your programs.*
- Answer any final questions that staff may have.

After the Session

- From the notes you took on the pieces of chart paper, compile a list of ways that models help with understanding and a list of possible models participants can use in the future.
- Within 2-3 weeks of the training, email participants.

- *Thank you for your participation in the recent Click2Science training on "Testing Predictions About Models". I hope you found it useful. Consider meeting with a co-worker, supervisor, or friend to share what you learned. I look forward to continuing our learning at the next session on SKILL/FOCUS on DATE at TIME at LOCATION. Please let me know if you have any questions. I can be reached at CONTACT INFO.*

Want to Earn Credit? Click2Science has teamed up with Better Kid Care to provide continuing education units. Check it out at: http://www.click2sciencepd.org/web-lessons/about

Crayon Rock Cycle
Instructions/Observations

Learning Objectives

- Youth will be able to identify the three types of rocks.
- Youth will be able to describe how each type of rock is formed.
- Youth will be able to develop a model of the rock cycle.

Materials

- Crayons – at least two different colors per group
- Very hot water
- One container per group – small Tupperware or recycled plastic bowls or measuring cups
- Aluminum Foil or foil cupcake liners
- Simple scrapping device (plastic knife, popsicle stick, etc)

Beginning Observations:

Look at the different crayons in front of you. List as many properties or observations you can about them before you begin.

As a group, decide which type of rock formation you would like to begin with. You do not have to go in order, but you MUST create and observe all three formations.

Sedimentary Formation

Directions:

1. Use your scrapping device to make small, particle size sediments out of your crayons or existing metamorphic or igneous rocks. If starting from fresh crayons, make sure you use at least two of your different colors.
2. Place the pile of sediments you just created on top of a small square of aluminum foil or cupcake liner.
3. Fold over the foil so that your sediments are encased in the foil.
4. Press down on the foil with your hand. Remove the foil and observe what your sediments look like now.
5. Cover the sediment formation up again. Place on the floor. This time step on the foil and crayons with all of your weight. Remove the foil and observe the rocks appearance this time.

Sedimentary Observations:

1. What was different about the appearance of the new "rock" formation when you compressed it with your hand as compared to when you compressed it with you foot?

2. What is the most important factor in creating sedimentary rocks?

Metamorphic Formation

Directions:

1. Use your scrapping device to make small, particle size sediments out of your crayons or existing sedimentary or igneous rock model. If starting from fresh crayons, make sure you use at least two of your different colors. (Hint: Using small chucks of sediments will be faster then trying to use the whole crayon or pre-existing sedimentary or igneous rock model.)
2. Place the pile of sediments you just created on top of a small square of aluminum foil or cupcake liner.
3. Fill your container ¾ full of really hot water.

4. Float your foil with the crayons on top of the water.
5. Watch as the heat from the water transfers to the foil and to the crayons. The crayons should start to melt.
6. Use a probe, such as your scrapping device, to check the crayons. When they are soft to the touch, remove the foil from the water.
7. Cool your crayons quickly by blowing on them.

Metamorphic Observations:

1. How did the heat affect the crayons?

2. What important factors are needed to make metamorphic rock formations?

Igneous Formation:

Directions:

1. Use your scrapping device to make small, particle size sediments out of your crayons or existing sedimentary or metamorphic rock model. If starting from fresh crayons, make sure you use at least two of your different colors. (Hint: Using small chucks of sediments will be faster than trying to use the whole crayon or pre-existing sedimentary or metamorphic rock model.)
2. Place the pile of sediments you just created on top of a small square of aluminum foil or cupcake liner.
3. Fill your container ¾ full of really hot water.
4. Float your foil with the crayons on top of the water.
5. Watch as the heat from the water transfers to the foil and to the crayons. The crayons should start to melt.
6. Continue to let it sit on top of the water until the crayons are completely melted and a smooth liquid forms.
7. Carefully remove molten crayons and let cool. Your totally melted and cooled crayons are now equivalent to igneous formations.

Igneous Observations:

1. Describe your rock formation.

2. What factors affect the formation of igneous rocks?

Other Observations:

1. When metamorphic rock formations are completely cooled, will they have different properties from the other types of rocks? What evidence from your rock helps you conclude this?

2. What role does cooling fast as compared to cooling slowly play in the rock formations?

3. Do rock formations start or end with any type of formation in particular?

4. Use the space below to draw the relationship between each of the three types of rocks. Include arrows to show how they are related and the factors that help make those formations.