Professional Development Situation: Training

Skill Focus: Making Connections to STEM Careers

Time Required: 90 Minutes

STEM CAREERS ROCK!

Participants will use science roles during the Building for the Big One activity to learn to connect STEM careers to OST activities.

Agenda

Welcome—5 minutes

Introduction—15 minutes

- Making Connections to STEM Careers Chart

See the Skill in Action— 15 minutes

- Trying Out Career Roles video-based learning module

Hands-on learning— 40 minutes

- Building for the Big One

Conclusion— 15 minutes

Materials

- Computer with Internet connection
- Projector and speakers
- Flip chart paper and markers
- Pens for participants
- 3 x 5 cards for participants
- Basket of "STEM rocks" to distribute at the end of the session
- One copy of Making Connections to STEM Careers Chart for each participant
- Trying Out Career Roles video-based learning module
- Building for the Big One
- Materials for Building for the Big One

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 "Making Connections to STEM Careers". 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 (5 min)

- Greet participants as they arrive. Make sure everyone feels welcome and comfortable.
- Introduce yourself and the focus of the session: "Making Connections to STEM Careers"
- Ensure participants are aware of the locations of restrooms facilities, refreshments, etc.

Introduction (15 min)

- Hand out the Making Connections to STEM Careers Chart. Ask participants to think about the most recent field trips, guest speakers, and activities they have done in their program.
- Give participants five minutes to fill out the table individually.
    - *How are these connected to STEM?*
    - *How might these be related to STEM careers?*
- Guide a discussion within the group to answer these questions (these may be projected, written on chart paper, or read aloud):
    - *How many of the activities on your chart included a STEM career connection?*

- *Think about one of the STEM careers you introduced to youth. How did you decide to share this career with youth? How did this career area complement the other activities you were leading with youth at the time?*
- *Now, think about one of the activities that did not include a career connection. As a group, brainstorm some career connections that could be a part of this activity the next time.*
- *It is not only important for youth to see possible careers out there, it is important for them to identify a person who has a similar career. It is also important for youth to see people like them in STEM careers. How do you introduce STEM role models to youth in your program?*
- *Did any of the activities on your checklist include a STEM role model? How did you identify that person?*

See the Skill in Action

- Introduce the video.
  - *In the video, we will see one strategy for introducing career roles as a part of the activity structure. You will have an opportunity to explore this strategy as well as other strategies for making career connections. Strategies can be used in any activity and should be applied to all career possibilities.*
- Show the skill video under Step Three of Trying Out Career Roles video-based learning module.
- Play the video again as needed. Pause for participants to respond; then debrief using these questions as a guide:
  - *How did the girls respond to their career- based roles?*
  - *What do you think about using careers to define tasks for group activities?*
  - *How did Katie support the youth in their career roles?*
  - *How might you facilitate this activity differently?*
- **Note**: As discussion continues, you may want to **revisit the video** as questions arise.

Hands-on Learning: Building for the Big One (40 min)

- Split participants into groups of three to four and follow steps on Building for the Big One. Assign each group member a specific role of either architect, geologist, or structural engineer (one to two people). Pass out the role cards to each person in the group. Assign each group a specific type of soil. Tell participants:
  - *The goal of your team is to develop a structure that can withstand an earthquake upon your specific soil type. The structure must be able to withstand the earthquake for at least 15 seconds.*

- Allow groups time to build their structures and test them against an earthquake. If times allows, let groups make adjustments to their structures after the initial testing.
- Reflect with the group (select two or three as time allows):
    - *What did you think about the way careers were included in this activity?*
    - *Who is a career role model you could share with youth related to this activity?*
    - *Are there activities you lead that could be formatted this way?*
    - *What are other ways you integrate careers into activities and experiences you lead with youth?*
    - *How is integrating careers into an activity, as we did today, different than a separate conversation or activity dedicated to careers?*
    - *How do you identify and share STEM role models with youth?*

Conclusion (15 min)

- Hand out notecards to each participant.
- Ask staff to think about ways they can lead activities in the future to make them connect to STEM careers. Have participants write them down.
    - *Are there new ways you can reinforce career connections with the activities you listed on your checklist? Use the 3x5 cards to jot down notes that might help you lead these activities the next time.*
    - *For some of you, the vast range of STEM careers available to youth may seem intimidating. I want to encourage you to think about one activity and career area at a time.*
    - *Remember to include a variety of careers and jobs. As the youth you work with are diverse, it's likely the careers that might interest them are, too.*
- Have participants share one thing they learned from the session with their tablemates.
- Follow up with pointers, questions, and encouragement.
- Direct participants to take a rock from the basket as they leave.
    - *As you leave please pick up one of the rocks on the table. Set it on your desk or include it in a display where youth will see it every day. Use it as a reminder to talk about careers as you help them learn about STEM skills*.

After the Session

- From notes you took on the pieces of chart paper, compile a list of strategies for organizing, recording and documenting experiments/experiences shared by the group. Share this in your follow-up email to participants.
- Within 2-3 weeks of the training, email to participants:

- *Thank you for your participation in the recent "Making Connections to STEM Careers" training. I hope you found it useful. Attached are some strategies the group discussed during the training. Consider meeting with a co-worker, supervisor, or friend to share the goals you are working on. 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

Making Connections to STEM Careers Chart

Programming *(Description)*	Goal or Focus	Career Connection	STEM Connection
Field trip			
Guest speaker			
Guest speaker			
Activity			
Activity			
Activity			

Building For the Big One

Courtesy of: https://www.techbridgegirls.org/

Goals

- To design a structure that can withstand the shaking of an earthquake.
- To understand how soil type affects a building's ability to withstand an earthquake.

Materials

- 20 Popsicle© sticks per group
- Hot glue gun (low temperature)
- 2 sticks of hot glue per group
- 1 golf ball
- 1 aluminum 8" round baking pan per group
- Play-Doh© (2 containers per "bedrock group")
- Grape-nuts© (1 box)
- Oobleck (1 ½ cup of cornstarch + 1 cup of water per "land group")
- Graph paper
- Ruler
- Pens
- Shake table
- Stop watch or other timing device
- Velcro© with adhesive backing
- Role note cards, one career role per card —Geologist, Architect, Structural Engineer, (1 set per group)
- Soil type note cards, one soil description per card— Bedrock, alluvium, gravel, land fill, (1 card per group)

Steps

1. Divide youth into groups of 3-4 , and assign each youth in the group one of three career roles: Geologist, Architect, and Structural Engineer (1 or 2).
2. Assign each group a soil type (Bedrock, Alluvium, Gravel, or Land Fill).
3. After testing each structure, ask each group about their design decisions, whether certain features made their building stable, and what they might change/add if they were to build it again.

The Geologist

Your job is to create the soil for your group.
Collect the following materials to develop the soil:

- Bedrock–pan filled with Play-Doh©
- Alluvium–pan filled with Grape-nuts© + enough water to soak them, but not fill the pan
- Gravel–pan filled with dry Grape-nuts©
- Land Fill–pan filled with Oobleck (1 ½cup of cornstarch + 1 cup of water)

The Architect

Use the graph paper and a pen to design a structure that meets the following parameters:

- Must be at least 25 centimeters (10 inches) tall
- Must hold a person (represented by a golf ball) without shaking them off or out of the structure
- Must fit on a pan
- Must be able to withstand 15 seconds of shaking without falling or collapsing (on shake table)

Work with the Geologist to determine if the design is feasible for the group's specific soil type.

The Structural Engineer(s)

Your job is to build the structure based on the Architect's design and the Geologist's recommendations.
Structures should be placed into pans and shaken for at least 15 seconds

Questions to further inquiry:

- What will you have to do to make your structure stand on your soil type?
- How will it need to be different from the other structures on different soil?
- How do people solve these critical problems? Do they work alone?

- How many times do you think it takes for engineers to get the design right? Do you think they get it on the first time?
- How many times did you have to try things? What did you learn that made you change things?
- What did the different roles add to the design?
- What did you have to consider in your design?
- Have you heard of the Richter scale? What does this mean?
- Why is it important to measure it this way? What does it tell us?
- In what ways does the shake table move?
- What determines the magnitude of the earthquake? *(The amount of energy released)*
- If you were to draw the force released from an earthquake, in what direction or directions do you think it travels? Starting where? *(Waves travel spherically from the focus)*
- How did your structure hold up to the various wave motions? What design changes or modifications will you consider for your next design?
- Did you try to find a way to keep your structure anchored to the ground? How did you do that? What do we call that part of the building? *(Foundation)*
- What shapes were used to build the structures that were able to withstand the earthquake (shake table) most effectively?

Information to further inquiry:

There are two kinds of surface waves during an earthquake: Love (up and down) and Raleigh (side to side). The energy released during an earthquake produces a force on the plates. This force has direction traveling spherically away from the point where energy is released (the focus). The force also has magnitude proportional to the amount of the energy released. Which ways did you see the waves move? *(Love and Raleigh)*

The following features affect building stability in designs:

- Foundation
- Shear
- Support/Reinforcement
- Triangles
- Wide to narrow (wide at base, narrow at top)
- Low center of mass

Resources: Making Connections to STEM Careers

Frontline staff and volunteers in out-of-school programs need to help youth connect the activities they do on a daily basis to real-life careers and pathways so that they can navigate into a satisfying career.

Connecting youth to careers in STEM includes four important pieces:

Youth need **STEM career role models**. Through posters in the learning space, video clips shared in activities, guest speakers/experts brought in from the community and hosts of field trip experiences, youth need to see diverse individuals (younger and older; highly educated and vocational school grads; men and women; diverse races and ethnicities; and people that work in offices, laboratories and out in the field). Through these characteristics, individual youth are more likely to see themselves in those STEM roles.

Identify STEM career opportunities connected to activities being led with youth. As frontline staff members are preparing to lead STEM activities with youth, one preparation piece should include career-focused information related to the activity. The tasks completed and knowledge applied in hands-on learning experiences are often similar to tasks completed by STEM professionals every day. An activity in which youth design water filters relates to environmental engineers. Activities in which youth observe, classify or manipulate animal behavior relate to animal scientists, veterinarians, zoologists and others. If youth are asked to study soils or rocks, they are doing similar tasks to those required of a geologist, soil scientist or farmer. STEM professions are broad and, in some cases, somewhat obscure. Helping youth see real-world choices related to activities they enjoy doing can help them see themselves in those careers. Youth need exposure to and assistance with **career pathways**. Youth may identify with a career choice but have no idea how to get from where they are to where they want to be. Choices along a career pathway include classes to take in middle and senior high school; technical school or college; specialized training; extracurricular experiences; and part- time employment, job shadow or internship opportunities. When interacting with youth, frontline staff can integrate career pathways into conversation and activities. In doing so, it is important to include careers that require differing levels of education.

Not all STEM careers require advanced college degrees. It is important to **include examples of STEM careers on all levels of the education spectrum**. Not all youth are able to pursue a career as a veterinarian for academic, financial or other reasons; however, a youth interested in helping animals may be interested in a career as a vet tech or feedlot worker or humane society caretaker, etc. These career choices may require only a high school diploma, a vocational or community college certificate or degree, or a bachelor's degree.

For additional information about career pathways and an interactive experience for youth, visit http://careerexplorer.unl.edu. Career Explorer also is available from the iTunes Store and the Google App Store for use on mobile devices.