

STEM Careers Rock

Professional Development Situation: Face-to-Face Training

Skill Focus: Making Connections to STEM Careers

Time Required: 90 minutes

Purpose: Afterschool staff members and volunteers will be able to identify job/career titles and work opportunities in STEM careers that will apply to activities with youth.

Time Required:

Pre-session preparation by participants: 30 minutes

Workshop session length: 90 minutes

Post-session follow-up by participants: 30 minutes

Objectives:

As a result of this training, frontline staff and volunteers will be able to:

- Identify the options youth have as part of the future STEM workforce.
- Introduce STEM role models that relate to the real world of the youth, including gender, race, class and ethnicity.
- Connect real-world STEM careers to activities they are facilitating.

Session Outline:

Welcome – 5 minutes

Introduction – 15 minutes

See the Skill in Action – 15 minutes

Hands-on Learning & Practice – *Building for the Big One* – 40 minutes

Conclusions – 15 minutes

Materials & Supplies:

Training Supplies

- Trainer Materials:
 - Computer with Internet connection
 - LCD projector
 - Timer
 - Flipcharts or large sheets of paper
 - Masking tape
 - Markers

- Name tags – Color-coded to break the participants into groups of 3 - 4.
- 3X5 cards
- Postcards
- Rocks (2-3 inches in diameter) on which you have written or painted the word “Careers”; they will be handed out as a reminder to talk about careers and practice making connections.
- Trainer Resources
 - Training Resource A. Sample pre-workshop email to participants
 - Training Resource B. *Making Connections to STEM Careers* Chart
 - Training Resource C. *Making Connections to STEM Careers* Conversation Guide
 - Training Resource D. Reflection Questions
 - Training Resource E. Sample post-workshop email to participants
 - Training Resource F. Background for the Trainer
- Participant Materials (1 per attendee, unless noted):
 - Handout A. *Building for the Big One* Activity Guide
 - Handout B. *Building for the Big One* Notes

Activity Supplies for *Building for the Big One* Activity (enough for participants to work in groups of 3 - 4)

- 20 Popsicle© sticks per group
- Hot glue guns (low temperature)
- 2 sticks of hot glue per group
- 1 golf ball per group
- 1 aluminum 8-in circular 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
- Rulers
- Pens
- Career labels
- Soil cards
- Shake table (or foil baking pan filled with golf balls or ping pong balls)
- Stop watch
- Velcro© with adhesive backing



Before the Session:

- Step One:** Read through this training guide to familiarize yourself with the content and allow time to personalize the activities to best suit your teaching style. Preview the videos and read Training Resource F for more background information.
- Step Two:** It is useful to assess the career connections already being made by frontline staff and volunteers who will be participating in the workshop session. To do this, send the sample email message in Training Resource A and ask participants to complete the Making Connections to STEM Careers Chart (Training Resource B).
- Step Three:** Gather all materials and supplies (listed earlier in this document) so you and the participants will have what you need to successfully complete the session. Prepare a poster (using the flipchart paper) with the list of supplies available to each team in the *Building for the Big One* Activity.

Training Outline

Welcome - 5 minutes

What I Say	What I Do
<p>Welcome. I appreciate that you all chose to be here today. We are going to focus on ways to help youth learn about careers and work possibilities that use STEM skills. How do we get youth to see the need to learn and develop STEM skills and connect them to their daily lives?</p>	<p>Greet participants. Make sure each feels welcome to be a part of the workshop. Also ensure the participants are aware of the location of restroom facilities, refreshments, etc. Provide each participant (including yourself) a color-coded name tag. Ask them to sit in groups with like-colored name tags.</p>



	<p>As people arrive, confirm that they completed the <i>Making Connections to STEM Careers Chart</i> (Training Resource B). If not, distribute blank copies for them to complete.</p>
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Introduction Activity - 20 minutes

What I Say	What I Do
<p>Before you came today, I asked you to complete the <i>Making Connections to STEM Careers Chart</i>. Please locate it now.</p> <p>Thank you for taking the time to do this. Hopefully, it helped you start thinking about today’s topic.</p> <p>In your group, use the conversation guide to think about your <i>Making Connections to Careers Checklists</i>. As you are talking, list career areas you have highlighted on a piece of flip chart paper.</p>	<p>Distribute <i>Making Connections to Careers Conversation Guides</i> (Training Resource C) and flip chart paper and markers to each group.</p> <p>Conversation Guide Questions:</p> <ol style="list-style-type: none">1. How many of the activities on your checklist included a STEM career connection?2. 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 compliment the other activities you were leading with youth at the time?3. 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.4. 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



	<p>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?</p> <p>As the groups discuss, float from group to group, answering questions and encouraging conversation.</p> <p>Allow the conversation to continue for ten minutes or until groups no longer seem on-task.</p>
<p>With a show of hands, how many had career connections in each of the activities listed on their checklist? Four? Three?</p> <p>Share your career lists by posting them on the wall.</p> <p>What observations do you make about these lists?</p>	<p>Bring the group back together for some whole group processing. With a handful of groups, it might be possible for each group to share. With a larger group, asking for general input might be more time effective.</p> <p>How are the careers listed similar? How are they different? Do they require similar education levels or training? Do the careers listed represent different types of work environments?</p> <p>How can the lists be enhanced to interest more youth?</p>
<p>The youth who participate in our programs are career bound. In our work, we can introduce them to career possibilities and help them see pathways to those careers. Today we are going to focus on strategies you can use to incorporate STEM careers into your daily work with youth.</p>	



<p>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.</p>	
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See the Skill in Action - 15 minutes

What I Say	What I Do
<p>Does anyone need to see the video again?</p> <p>Now, take a moment to respond to the reflection questions on your handout.</p>	<p>Distribute the Reflection Questions handout (Training Resource D). Allow the participants a moment to read the questions.</p> <p>Play the skill video under step three at http://click2sciencepd.org/learning-modules/trying-out-career-roles</p> <p>Play the video again as needed. Pause for participants to respond; then debrief using the reflection questions as a guide.</p> <p>Reflection Questions (Training Resource D):</p> <ul style="list-style-type: none">- 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



	<p>differently?</p> <ul style="list-style-type: none"> - What is an activity you use that could be led this way? <p>What impact did the video have on your intent to include career connections in activities?</p>
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Hands-on Learning & Action (40 minutes):

What I Say	What I Do
<p>We are going to use the next block of time to explore the <i>Building for the Big One</i> Activity and focus on making connections to STEM careers. For this activity, you will continue to work in your small group.</p> <p>The <i>Building for the Big One</i> Activity assigns youth career-based roles as an architect, structural engineer or geologist. Their tasks in designing and building a structure to withstand an earthquake are defined by their career assignment. The supplies listed in the activity guide are available for us to use today.</p> <p>Use <i>Building for the Big One</i> Notes as you work through the activity to help formulate ways to help youth think about careers.</p>	<p>Distribute the <i>Building for the Big One</i> Activity Handouts A and B. Randomly assign each group one of the following soil types:</p> <ul style="list-style-type: none"> - Bedrock - Alluvium - Gravel - Landfill <p>Handout B should be used to help develop ideas that can be used in future activities.</p>
<p>We will be taking some breaks as you are working on the activity for you to focus on making connections to STEM careers. Begin by taking five minutes to read the activity</p>	<p>Set a timer for five minutes.</p>



<p>guide. I will be using a timer to keep us on schedule.</p>	
<p>In your small group, describe how you would introduce these roles to the youth learners.</p> <p>We will take three minutes for this.</p>	<p>Some methods might be asking youth to describe what they know about each role, oral instructions, handouts, or making a poster of each role.</p> <p>Set a timer for three minutes.</p>
<p>Now you will have a few minutes to act out your roles and begin work on <i>Building for the Big One</i>.</p> <p>You will have twenty minutes for this. At the end of this time, we will test our structures. .</p>	<p>Set a timer for twenty minutes.</p> <p>While the groups are working, float around the room to assist.</p>
<p>Now, let's test our structures. Remember that your earthquake should last at least fifteen seconds. Everyone will get a chance to use the shake table.</p>	<p>Give each group a chance to test its structure.</p> <p>As the groups test their structures, model how someone leading the activity would follow up with the different career roles as Molly does in the video.</p>
<p>Now, take a few minutes to discuss ways you can support youth as they are working on this activity. What questions might they have? How would you answer them?</p> <p>I would also like you to identify one or more STEM role models you could introduce to youth along with this activity. They might be people you know or know of, roles at companies that are familiar to you or general descriptions that you will use to find an example online later. STEM role models can</p>	<p>Set a timer for five minutes.</p>



<p>be people who are able to visit your program or host your group on a field trip, people willing to have a Skype or phone conversation with your youth, or people whose profiles you share in a handout or poster in your work room.</p> <p>I've posted flip chart paper on the back wall for you to share your STEM role model ideas related to this activity. I will distribute the lists in a follow-up email to this session.</p>	
<p>I would like each group to share one thing they learned in this process.</p> <ul style="list-style-type: none">• What are some ideas you identified in the notes handout?• How can we emphasize and model making connections to careers as youth participate in STEM activities?	<p>Select a group and begin the sharing process.</p> <p>De-brief questions (select two or three as time allows.)</p> <ul style="list-style-type: none">- 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? <p>As discussion continues, you may want to revisit the video again as questions arise. Continually</p>



	tie the model video to the learners' application and practice.
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Conclusions (15 minutes):

What I Say	What I Do
<p>Before coming today, you were asked to think about how you shared STEM careers and role models with your learners.</p> <p>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.</p>	<p>Hand out 3X5 cards.</p> <p>Allow a couple of minutes for this, as time permits and participants are engaged.</p>
<p>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.</p> <p>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.</p>	
<p>Now I would like each of you to share with your group one thing you learned or re-learned today and one way you plan to apply it in your work.</p>	<p>Support the learning. As participants share, follow up with pointers, questions, encouragement, etc. (Be sure to take notes to compile a list of ideas discussed to send out as a summary of the training session.)</p>

Thank you for committing to being here today and working to develop skills as staff members or volunteers. You know that we asked you to do some work before you came to the session. The purpose was to use the knowledge and experience you brought with you today as a foundation to build on training.

We'll all have more opportunities to learn from each other. I will be sending you an email with follow-up instructions that include how to use an online discussion board reflecting this session, additional resources for developing your skills as a STEM facilitator, and an evaluation of today's workshop.

Takeaway: 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.

Please don't hesitate to ask if you have additional questions, and I look forward to seeing you at our next session.

Set out the rocks you have collected so participants can take one as they leave the meeting.

Include other end-of-day details as applicable to your organization.

After the Session:

Step One: Reinforce the learning by the participants using the sample email (Training Resource E) to thank them for participating and to provide the post-workshop resources.

Step Two: Compile a list of the ways participants intended to apply the material at the conclusion of the workshop. Include that list as an attachment to the email.

Training Resource A

Sample pre-workshop email to participants

Email to send participants ten to fourteen days prior to the PD session:

The next professional development opportunity to enhance our STEM skills will be on DATE at TIME at LOCATION. Our focus for this workshop will be *Trying out Career Roles: Making Connections to STEM Careers*.

Please complete the following to prepare for the workshop:

- Download and fill out the attached Making Connections to STEM Careers Checklist. This sheet will take 5-10 minutes to complete.

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.

Training Resource B

Making Connections to STEM Careers Chart

Think about recent STEM activities you have led with youth. Complete the following chart before coming to the training session.

Activity	Describe the activity.	What was the educational goal or focus?	Were any STEM careers highlighted?	Could youth interact with STEM role models?
Your last field trip				
Guest Speaker 1				
Guest Speaker 2				
Guest Speaker 3				
Activity 1				
Activity 2				
Activity 3				

Training Resource C

Making Connections to STEM Careers Conversation Guide

Use the following questions to guide discussion about the chart completed prior to the workshop session:

1. How many of the activities on your chart included a STEM career connection?
2. 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?
3. 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.
4. 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?

Training Resource D

Reflection Questions

- 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?
- What is an activity you use that could be led this way?
- What impact did the video have on your intent to include career connections in activities?

Training Resource E

Sample post-workshop email to participants

Email to send participants following the workshop session:

Thank you for participating in our recent professional development session focused on *Trying out Career Roles: Making Connections to STEM Careers*. I valued our time together and hope you have found the experience applicable to your work with youth.

To complete the session, I ask that you do the following:

- Display your Takeaway Rock where you and the youth you work with can see it on a regular basis. Use it as a reminder to talk about different careers that are connected to the activities and STEM learning experiences.
- Explore career pathways using the Career Explorer available at <http://careerexplorer.unl.edu/career.php?l=6&c=c4&e=4&j=0&p=>

At the end of the workshop, you all identified one or more ways of Making Connections to Careers in your work. I am including a summary of the ideas you generated. You are encouraged to use these ideas when leading your own STEM activity sessions.

I look forward to continuing our learning at the next session on SKILL/FOCUS at on DATE at TIME at LOCATION. Please don't hesitate to ask if you have any questions. I can be reached at CONTACT INFO.

Training Resource F

Background for the Trainer

Making Connections to STEM Careers

This training focuses on developing the skills of frontline staff and volunteers in making connections to STEM careers during STEM learning experiences. The need for youth to pursue careers in STEM fields is imperative. The United States is not currently producing enough STEM professionals to meet the needs of industry, academia and government agencies. The need for qualified workers will continue to grow. To meet this need, 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.

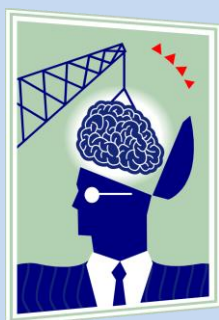
Connecting youth to careers in STEM includes four important pieces:

- 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 animal handler 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.php?l=6&c=c4&e=4&j=0&p=>. Career Explorer includes an interactive experience for youth at <http://careerexplorer.unl.edu/>. Career Explorer also is available from the iTunes Store and the Google App Store for use on mobile devices.

Handout A

Building for the Big One Activity Guide



Grade Level:
Grades 5 – 12

Activity Time:
Medium (1 hour)

Preparation Time:
30 minutes

Grouping:
3 – 4 girls per group

Skills:
Working as a group to solve a problem



*Adapted from:
The Tech Museum of
Innovation, San Jose, CA

Objective:

- 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:

1. 20 Popsicle© sticks per group
2. Hot glue guns (low temperature)
3. 2 sticks of hot glue per group
4. 1 golf ball per group
5. 1 aluminum 8-in circular baking pan per group
6. Play-Doh© (2 containers per “bedrock group”)
7. Grape-nuts© (1 box)
8. Oobleck (1 ½ cup of cornstarch + 1 cup of water per “land group”)
9. Graph paper
10. Rulers
11. Pens
12. Career labels
13. Soil cards
14. Shake table (or foil pan with golf balls or ping pong balls)
15. Stop watch
16. Velcro© with adhesive backing

Directions:

The goal of this activity is to design and build a structure that can withstand a major earthquake, using only the materials supplied (20 craft sticks, glue gun, 2 sticks of glue).

- How many of you have experienced an earthquake?
- What was it like?
- What did you have to do?
- What was important in terms of protecting yourselves?
- What are things we should think about when trying to build something that can withstand a major earthquake?

1. After dividing the youth into groups, each youth in the group will be assigned one of three career roles: Structural Engineer (1 or 2), Geologist and Architect.
2. The **Geologist** in the group will be given the group's soil type: bedrock, alluvium, gravel or landfill. Collect the following materials to develop the soil:
 - Bedrock pan is filled with Play-Doh©
 - Alluvium pan is filled with Grape-nuts© + enough water to soak them, but not fill the pan
 - Gravel pan is filled with dry Grape-nuts©
 - Land fill pan is filled with Oobleck (1 ½ cup of cornstarch + 1 cup of water)

3. The **Architect** in the group will be given graph paper and a pen and asked to design a structure that meets the following parameters:

Parameters:

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

The **Architect** will work with the **Geologist** to determine if the Architect's design is feasible on the group's specific soil type.

4. The **Structural Engineer(s)** will build the structure based on the **Architect's** design and the **Geologist's** recommendations.

Testing/Demonstration/Reflection:

5. The entire group will participate in testing its structure.
 - What did need to know about the soil in order to make your structure?
 - How did you work with your team to create a design?
6. Structures should be placed into pans and shaken for at least 15 seconds.
7. After testing each structure, ask each group about some of their design decisions, whether certain features made their building more stable, and what they might change/add if they were to rebuild again.

- Ask youth to think through what they have done and what they think engineers actually do to solve a problem.
- What do you notice about the soil?
- What will you have to do to make your structure stand on your soil type?
- How will it need to be different than the other structures on different soil?
- Do you think that people work alone to solve these critical problems or how do you think they might work?
- Do you think engineers get it right the first time? How many times do you think it might take?
- 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?

Teaching points for the Design Challenge:

Ask questions to pull concepts out of youth such as:

- Which ways did you see the waves move? What did you have to consider in your building (Foundation)?
- Have you heard of the Richter scale – what does that mean?
- Why is it important to measure in this way?
- What does it tell us?
 - 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.

Look for the following features that affect building stability in various student designs:

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

Questions to encourage teaching points:

- In what ways does the shake table move?

- What determines the magnitude of an 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 away 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 in the ground? How did you do that? What do we call that part of the building? (foundation)
- What shapes used in building the structures that were able to withstand the earthquake (shake table) most effectively?

Handout B

Building for the Big One Notes

During the *Building for the Big One Activity* time, you will be stopped from time to time to think about how you would facilitate this activity (and others) focusing on making connections to STEM careers. Use this guide for taking notes to help you plan activities with your youth better focusing on careers in the future.

1. What are three ways you could introduce the career roles of geologist, architect and structural engineer to youth participating in the activity?
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 -
 -
2. How will you support youth as they are working on this activity to understand their roles as geologists, architects and structural engineers?
3. Who are some STEM role models that could accompany this activity? STEM role models are people who have career paths as geologists, architects and structural engineers or similar careers. STEM role models can be shared with youth in person, via Skype or telephone call or through profiles described on posters or handouts. If you do not know individuals in these roles, think of companies that might employ people who do these things, or list search terms you could use to look online for these STEM role models.