

Professional Development Situation: Training

Skill Focus: Enabling Active STEM Learning

Time Required: 60 minutes

GET ACTIVE

Participants will compare active and passive learning and convert passive learning activities to more active ones in order to engage youth in active learning.

Agenda

Welcome—5 minutes

Introduction—15 minutes

- [Active Learning Notetaking Page](#)

See the Skill in Action—10 minutes

- [Designing a Grape Smasher](#) video-based learning module

Make it Active!—20 minutes

- [Activity Guide for Elephant Toothpaste](#) (or other activity guide) for making more active

Conclusion—10 minutes

Materials

- Computer with internet connection
- Projector and speakers
- Flip chart paper and markers
- Stack of blank paper (for name tents and notes)
- Pens for participants
- One copy of [Active Learning Notetaking Page](#) for each participant.
- [Designing a Grape Smasher](#) video-based learning module
- One copy [Activity Guide for Elephant Toothpaste](#) for each group.

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 “Enabling Active STEM Learning.” 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 in the learning environment.
- Introduce yourself and the focus of the session: “Enabling Active STEM Learning”
- Ensure participants are aware of the locations of restrooms facilities, refreshments, etc.
- Have each participant make a name tent with their name written on one side and their most boring class ever on the other.
- Encourage participants to share name tents.
 - *What made the class boring?*
 - *What was your participation like during that class?*
 - *How much would you say you learned in the class?*
- Sum up:
 - *We learn best by doing, not by listening, watching, or even reading. These can be sources of information but real learning sticks when we apply that knowledge in real life. Today is all about helping learners be more active in the process.*

Introduction: Active v. Passive (15 min)

- Introduce the focus of the day. Pass out the [Active Learning Notetaking Page](#)
 - *We are going to focus on active learning today. Even some hands-on activities can encourage youth to be more “active.”*
- Put up a large Venn Diagram. Write “Active” on one side and “Passive” on the other. Ask participants what is different about active and passive learning.
 - What types of materials are used for Active STEM Learning?
 - **Suggested responses:**
 - Active: Hands-on, manipulatable, at the very minimum a pencil and pen to interact with paper
 - Passive: Few materials, copying notes, reading without stopping to work with the new information
 - What considerations should be made in regard to time and space?
 - **Suggested responses:**
 - Active: Takes longer and takes more space.
 - Passive: Can “cover more” in less space
 - What do children’s expressions and questions tell the adult about whether or not they are interested in the materials?
 - **Suggested responses:**
 - Active: It’s loud, faces are expressive, bodies are turned toward activity
 - Passive: bodies facing adults, quiet
 - How might adults support children’s inquiry and/or creativity, imagination and curiosity?
 - **Suggested responses:**
 - Active: Adults ask open-ended questions and avoid telling the answers
 - Passive: Adults tell children facts or downplay the importance of emotions.

See the Skill in Action (10 min)

- Participants will now compare active and passive approaches to learning while watching a video.
 - *What do you think about watching a video? Is that an active or passive strategy? (Passive)*
 - *What if you call out “stop” during the video so we can discuss something of interest? (Active)*
- Assign half the room to be “Team Active” and the other half “Team Passive.”

- Cue up the [Designing a Grape Smasher](#) video-based learning module.
 - *We are going to watch a video of a facilitation of the Grape Smasher Activity.*
 - *TEAM ACTIVE: You will make a note when you see youth actively engaged in science learning.*
 - *TEAM PASSIVE: You will make a note when you see youth positioned as passive learners in an activity. I will ask later you to explain what you saw.*
 - *We also want to respect this instructor who is doing their best to get kids involved in hands-on learning. This is a video of real practice, not necessarily perfect practice.*
 - *Everyone ready?*
- Watch the activity overview video. Allow participants to share their thinking, and encourage participants to think of ways they might blend active and more passive strategies.
 - *It's okay for youth to be passive at times; we just don't want this to go on for more than 10 minutes or so without something active.*
- Then, repeat this activity with the video in step 3.
- Debrief.
 - *What did the staff member do well?*
 - *What could the staff member do better?*
 - *Could you use this two-teams protocol to watch a video with your youth?*

Make it Active! (20 min)

- Split participants into groups of two to three.
 - *We are now going to put the "active" back in this activity by adding strategies to make it more hands-on for youth.*
- Pass out the activity guide for [Elephant Toothpaste](#) to each pair or group of three.
 - **Notes:** You will not be making elephant toothpaste in this activity; you are just using it as an example of a fairly passive lesson with prescribed investigative sequence. If you want to use other lessons from your curriculum, go ahead!
- Introduce Elephant Toothpaste and explain that participants will **make this activity more active**.
 - *You are going to use this activity as a baseline. The objectives of this activity are to get youth to understand that **substances react to each other** and that new substances have **different properties** than previous substances. In this activity, typically youth watch while the adult makes the mixture. While it might be a cool demonstration, how could youth be more hands-on, minds-on participants?*

- *What could they do before the activity?* (Play with elephant toothpaste, touch it, ask questions about it)
- *What could they do during the activity?* (Use different combinations of materials to make their own elephant toothpaste, write down questions that arise, keep track of what ratios of the substances they use)
- *What alternate activities might help youth be more hands-on as they learn about substances?*
- *What activities would allow youth to safely change the amount of material that's used to investigate the nature of chemical reactions?*
- Give participants **time to work** on making their lesson more active.
- Have participants **share** with the room.
- If possible, **keep notes** on the strategies for making learning more active.

Conclusion (10 min)

- Debrief this activity as a whole group. Return to the list of adjectives you made on chart paper at the beginning of the session.
 - *Did this activity allow for each of these elements of active learning?*
 - *How is this activity an example of hands-on, active learning?*
 - *What could we do to turn this into an investigation?*
 - *How could we make this activity more open-ended and less step-by-step?*
- Conclude by sharing that active, hands-on, “minds-on” learning is an important part of youth development work and a necessary part of STEM.

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 participants:
 - *Thank you for your participation in the recent Click2Science training on “Enabling Active STEM Learning”. 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 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.*

- If possible, attach the list of strategies participants shared to make their learning activities feel more engaged and active.

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>

Active Learning Notetaking Page

Active		Passive
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Elephant Toothpaste Activity Guide

Grade Level: K-5

Activity Time: 15-20 minutes

Preparation Time: 15 minutes

Grouping: Small groups of 6-8

Objectives:

- To explore the catalytic action created by the combining of yeast, hydrogen peroxide and dishwashing liquid.

Kid-Safe Elephant Toothpaste "Recipe"

- One 16 ounce empty plastic water bottle, preferably with a narrow neck
- ½ cup 3% hydrogen peroxide
- 1 squirt liquid dishwashing detergent
- A few drops of food coloring (optional – it does make a mess that can stain)
- 1 packet of dry active yeast dissolved in about two tablespoons of warm water <<Do this before the kids arrive for each session >>
- 1 funnel
- 1 foil pan with fairly high sides

Activity Directions

1. About 30 minutes prior to the activity mix up the yeast and water and let it sit undisturbed.
2. When youth arrive introduce the activity. Provide an opportunity for youth to explore the yeast with their senses (smell, touch, sight).
3. Introduce the other materials by engaging the senses of youth and asking if they know what the materials are typically used for.
4. Depending on the age of youth, have one individual add the food coloring to the hydrogen peroxide, if desired.
5. Stand the plastic bottle in the middle of the foil pan.
6. Use the funnel to pour the peroxide into the bottle, again this could be done by youth, depending on the age you are working with.
7. Squirt a small amount of dishwashing liquid into the bottle, add the yeast, remove the funnel quickly and then stand back and watch the foam erupt!

How does it work?

The catalytic action creates foam that shoots up out of the bottle and resembles toothpaste being squeezed out of its tube. The foam consists of soap and water with oxygen bubbles, so it's safe for kids to play with. This foamy substance isn't really toothpaste - people just call it that because when it's made, it looks like enough toothpaste to clean an elephant's teeth. Making this foam is a fun way to teach kids some basic chemistry, and all you need are some ordinary household supplies. Sometimes called the "marshmallow experiment," the process of making foam is a favorite with kids and a whole lot of fun for everyone watching.

How to Make Foam

Basically, making elephant foam toothpaste involves mixing hydrogen peroxide with liquid soap and then adding a catalyst (yeast or potassium iodide, for example) to make the hydrogen peroxide quickly break down into oxygen and water. This rapid breakdown of peroxide releases oxygen, which is quickly pushed out of the mixture's container. And, as the peroxide is breaking down into oxygen and water, the liquid soap in the mixture combines with the water that is produced and becomes foamy.