

Professional Development Situation: Training

Skill Focus: Modeling Engineering Practices

Time Required: 60 minutes

EASY AS A PICKLE SANDWICH

Participants will design a sandwich “protector” to learn how engineers use multiple practices to design solutions.

Agenda

Introduction—5 minutes

Engineering Design—20 minutes

- Design a Sandwich Container

Testing Designs—15 minutes

Debrief & Closing—20 minutes

Materials

- One copy of the [Engineering Design Practices](#) for each participant
- One per group
 - Pickle & cream cheese sandwich
 - Aluminum foil torn into 12” long sheets
 - Plastic wrap torn into 12” long sheets
 - Index cards (3 per group)
 - Package of sticky notes
- Optional: Small pan of water for package/sandwich to be submersed into
- Optional: A brick

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 a 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 Engineering 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 material 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.

Session Outline

Introduction (5 min)

- Explain that engineering is a continuous cycle of defining problems, designing solutions, and testing those solutions, and that engineers work together. Today participants will attempt to solve a problem in groups:
 - *Joe loves cream cheese and pickle sandwiches. He eats one every day for lunch. The trouble is they always get smashed in his backpack and wet from the rain. He’s even had pickle juice leak into his textbooks. He wants you to help him design a container for his favorite kind of sandwich.*
- Introduce the **constraints**:
 - *We are limited to the materials here: plastic wrap, tin foil, plastic wrap, index cards, and sticky notes. We are also limited by time.*
- Introduce the **criteria for success**:
 - *The project is successful if the sandwich does not tear, flatten, or have juice squish out the sides.*
- Introduce the **testing** environments.
 - *You may test your design at any point in your build process. There are sandwiches available up here; try to use only one per group. Use the pan to test waterproof-ness, the brick (or book) to test its resistance to smashing, and you can throw it against the wall to test its toughness.*

Design Time (20 min)

- Give participants time to work.
- Ask questions about criteria, constraints, and testing in order to prompt them to think like engineers:
 - *Which criteria for success are you the most worried about?*
 - *Which constraint is the most challenging?*

Testing (15 min)

- Ask groups to gather around the testing environment. Ask each group to prepare their cream cheese and pickle sandwich for a final test: submersion, throwing at a wall, and smashing by a brick.
- Test each group's sandwich as it's submerged, thrown, and smashed.
 - Optional: If you won't have easy access to water or a brick, it's okay to test the design just by throwing it against a wall.
- Ask them to think about future iterations:
 - *What would you do differently next time?*
 - *How do you feel about your design?*

Conclusion (20 min)

- Pass out the [Engineering Design Practices Handout](#). (The practices listed there are taken from the [Next Generation Science Standards](#) criteria for science and engineering practices.)
- Ask participants to read through the list of the practices in the handout.
- Then ask them to write down what they did while working on their Sandwich Protector that helped them practice these engineering steps.
- Debrief. Ask:
 - *Which engineering design practices will be difficult for youth?*
 - *How can you highlight the engineering design practices with your youth?*

After the Session

- Email the participants:
 - *Thank you for your participation in the recent Click2Science training. I hope you found it useful and applicable to your practice. I am including the Engineering Design Practices handout we worked on with our Pickle Sandwich design activity to help you connect youths' learning to engineering design. Consider sharing your thoughts with a co-worker, supervisor, or friend. Additionally, you can reach me at ____.*
- Attach a list of the Engineering Design Practices:

- Defining a problem
- Using scientific knowledge (or even common sense about physics or materials) to think of a solution
- Develop a solution
- Compare two ideas to choose the best one
- Optimize the performance of our design
- Test our design
- Note failure points (where our design failed)
- Collaborate effectively
- Reflecting on how it went

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Engineering Design Practices

Write down ways that you used the engineering design practices in this activity.

Engineering Practice	How We Used It
Defining a problem	
Using scientific knowledge (or even common sense about physics or materials) to think of a solution	
Develop a solution	
Compare two ideas to choose the best one	
Optimize the performance of our design	
Test our design	
Note failure points (where our design failed)	
Collaborate effectively	
Reflecting on how it went	