Unit: Designing Circuits for Neurodevices

Lesson 6: Design Challenge Presentations

Author: Sadie Frady

Image credit: Center for Neurotechnology

LESSON OVERVIEW

Activity Time:
One 55 minute class period.

Lesson Plan Summary:
In this lesson, students will present their posters and prototypes to the class, providing an opportunity to develop scientific communication practices.

STUDENT UNDERSTANDINGS

Big Idea & Enduring Understanding:

- **Scientific Communication:** Students will present their completed prototypes of neural devices and share with each other their design processes.

Design Challenge/Scientific Phenomenon: Scientists, engineers, and researchers publicly communicate their findings through talks at professional conferences, media interviews, publications in academic journals, and other mediums. A particular form of scientific communication is the poster presentation, where a scientific poster is developed to communicate highlights of a research study and presented during a poster session, in which participants engage in informal conversations about the research.

Driving Question:

- How can I best present my completed prototype to my peers?

Learning Objectives:

Students will know…

- How to best present to their peers about their completed prototypes of their designed devices.

Students will be able to…

- Inform their peers on how their prototype works and what purpose it serves.

Vocabulary:

- **Poster:** A scientific poster provides a particular format for communicating a research study. Generally, scientific posters are presented during a poster session at a conference or scientific meeting. A scientific poster includes information about the research study such as title, authors, background, research question/hypothesis, methods, findings, discussion, and acknowledgements.
- **Prototype:** A model of a design, typically an early version of a model. Prototypes can be "looks like" and "works like" models. A prototype is often iterated on through multiple testing and re-design phases.

Next Generation Science Standards:

This lesson builds toward the following bundle of Performance Expectation (PE) and their integrated three dimensions of learning. Additional dimensions are denoted with an asterisk (*).

High School Performance Expectations		
HS-PS3-3: Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy. (Grades 9-12). **HS-ETS1-1:** Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. **HS-ETS1-2:** Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.		
Science and Engineering Practices (SEPs)	**Disciplinary Core Idea(s)**	**Crosscutting Concepts (CCCs)**
Constructing Explanations and Designing Solutions *Obtaining, Evaluating, and Communicating Information	PS3.A: Definitions of Energy PS3.D: Energy in Chemical Processes	Energy and Matter Connections to Engineering, Technology, and Applications of Science

	ETS1.A: Defining and Delimiting an Engineering Problem ETS1.C: Optimizing the Design Solution	• Influence of Science, Engineering and Technology on Society and the Natural World

Common Core State Standards:

In this lesson, students will engage in literacy practices in science and technical subjects that build toward competency with the following standard:

- CCSS.ELA-LITERACY.SL.11-12.4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

TEACHER PREPARATION

Materials

Material	Description	Quantity
Sticky Notes	Sticky notes in three different colors. Each student will receive enough of each color to place one of each color on each poster they view (e.g., Student B will view 6 posters, so they will need 6 of each color of sticky note)	See notes
Student Handout 6.1	*Peer Review* 1 handout per group member for each student (e.g., student A is in a group of 3, so they would receive 2).	See notes

Preparation

1. Make copies of *Student Handout 6.1: Peer Review*. You will need enough copies so that each student has one copy for every group member they have (e.g., student A is in a group of 3, so they would receive 2 copies of the handout).

2. Pre group sticky notes so that you can easily pass them out when they are needed.
    a. Each student will need 3 different colors and one of each color per poster they will be viewing.

PROCEDURE

Engage (5 min): Entry Task

1. Post the following entry task on the board or in whatever format you use in your classroom.
    What was the most challenging part of this project? Least challenging?

Explore, Explain, Elaborate (20-30 min): Gallery Walk

2. Direct students to get out their posters and sit with their group if they are not already.

3. Divide the class into two: one half of the groups will be presenting in the first session and the other half of the groups will be presenting in the second session. Those groups not presenting in each session will serve as the audience.

4. Have the groups of students that are presenting first set up their posters and completed prototypes/devices next to them.

5. While they are setting up, pass out sticky notes of 3 different colors to each group not presenting.

6. Project the following information on what the sticky notes mean. Consider using sticky notes that match the color of the text highlighting for a quick reference for students (you can change the color of highlighting to match the color of the sticky notes you have on hand).
    a. *Using the sticky notes provided, write one thing you think, you wonder and any next step suggestions you have.*

7. Ensure that students know that they will not be allowed to write anything rude or inappropriate, and that they are required to leave one of each color of sticky note at each poster.

8. Have students travel in their groups to visit each poster and leave feedback using the sticky notes. Consider timing this or allowing students to walk freely to each poster based on your students and classroom environment.

9. Switch which groups are presenting for the second session. Repeat steps 4-7 with the other half of the groups, ensuring each group gets the chance to present and to be part of the audience.

Evaluate (10-20 min): Reflection and Peer Reviews

10. Post the following questions/prompts on the board.
    a. *What are you most proud of in your poster?*
    b. *What was one of the biggest challenges you encountered? Why was it challenging? How did you feel initially?*
    c. *How did you overcome your challenges? What resources did you seek to help you through your challenges?*
    d. *What tips would you give to a student who will be designing a research poster in the future?*
    e. *If you were to grade yourself using the rubric now, what grade would you give yourself and why?*

11. Have students discuss these questions within their groups. Consider having students write down their responses.

12. Have one student from each group share out a brief summary of what was discussed.

13. Distribute copies of *Student Handout 6.1*: *Peer Review* to students, one per group member that they had.

14. Direct them to complete *Student Handout 6.1* anonymously and turn in to you when done.

STUDENT ASSESSMENT

Assessment Opportunities:

- Teachers can check on student understanding and engagement during the class discussions.
- Students can be asked to write down and turn in their responses to the discussion prompts in Step 10, which includes their own self-assessment.
- Peer assessments will be provided through completion of *Student Handout 6.1.*

Student Metacognition:

- Students will reflect on their learning and teamwork processes through the reflective discussion prompts and through peer assessment.

Scoring Guide:

- Students are successful when they have completed the gallery walk in an academically appropriate manner and have completed the peer review (*Student Handout 6.1*).
- Consult *Student Handout 5.2: Engineering Design Rubric* that was provided in Lesson 5.
- Each group's poster should be graded using *Student Handout 5.3: Research Poster Requirements* and *Student Handout 5.2: Engineering Design Rubric.*
- The peer review provided by students' completion of *Student Handout 6.1* for their group members is used to assign up to 5 points on the scoring rubric from Lesson 5. A peer review(s) that is low for valid reasons is used to assign anywhere from 0-5 points in this section. See below for the portion of the rubric based on the peer review.

Research Team Peer Grades	**An average of the score given to the student by their research team.**	**Student received all good scores/reviews from their team. There were no issues with the student's participation and contribution.**	**Student received a mix of scores and reviews from their team. There may have been some issues.**	**Student received all bad scores/reviews. There were issues.**	**/5**

EXTENSION ACTIVITIES

Extension Activities:

- You can facilitate an informal gallery walk activity or professionalize it as poster session to provide students with more authentic experiences with scientific communication. Invite authentic audience members, such as engineers or graduate students from a local

university or industry. See the resources in the Teacher Background & Resources section about how to present a scientific poster at a poster session.

Adaptations:

- If a student(s) is unable to participate in presenting their poster, they could record a video of themselves presenting it.

TEACHER BACKGROUND & RESOURCES

Background Information:

- Teachers will need to understand how to coach students in presenting a scientific poster and how to engage in peer assessment. The resources below may be helpful.

Resources:

Peer Assessment
Cornell Center for Teaching Innovation
https://teaching.cornell.edu/teaching-resources/assessment-evaluation/peer-assessment

How to Present an Academic Research Poster Video (5:00 min)
The iSchool, Syracuse University
https://www.youtube.com/watch?v=0ozwCEeaVWE

Ten Simple Rules for a Good Poster Presentation
Erren & Bourhne, 2007, PLOS Computational Biology
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1876493/

A Guide to Presenting a Poster
Cain Project, Rice University
http://www.owlnet.rice.edu/~cainproj/presenting.html

Unit: Designing Circuits for Neurodevices
Student Handout 6.1: Peer Review
Name:_____ Date:_____ Period:_____

Team Member Name:		
Question	***Response***	***Other Comments***
Did this team member contribute to the design challenge process?		
Did this team member act as a part of the team?		
Do you feel like this team member did what they were supposed to?		
If you were given $1,500 to split amongst your group from the National Science Foundation for your work, how much would you give this team member? Explain in the comments.		
Your Name:		