

Teacher-led Reflection Activity

Mrs. Tawni Paradise, Virginia Polytechnic Institute and State University

Tawni is a third year Ph.D. candidate in the Department of Engineering Education at Virginia Tech. She holds a B.S. and a B.A. in Industrial & Systems Engineering from The University of San Diego in San Diego, CA. Drawing on previous experiences as a mathematics and engineering teacher, her current research interests include studying the disconnect between home and school, with a specific emphasis on prekindergarten students. She continues to pursue these research interests with the support of the NSF Graduate Research Fellowships Program. She previously served as a Student Support and Program Staff for the Center of Enhancement for Engineering Diversity where she taught a seminar for first-year female engineering students and coordinated precollege outreach events. As a researcher, she has previously served as a Graduate Research Assistant on the VT PEERS project studying middle school students regularly engaging in engineering activities. In addition, she dedicates her spare time to exhibiting at the Virginia Tech Science Festival and hosting several sessions for the Kindergarten-to-college (K2C) Initiative.

Malle R Schilling, Virginia Polytechnic Institute and State University

Malle Schilling is currently pursuing a PhD in Engineering Education from Virginia Tech. Malle graduated in 2018 with a Bachelor's degree in Mechanical Engineering from the University of Dayton. Her research interests include broadening participation in engineering, the use of assets-based frameworks and pedagogies in engineering education, rural K-12 engineering education, and engineering identity.

Reflective Engineering Activity for Students

Activity Overview: This activity is meant to support teacher understanding of student perceptions of engineering, and can help guide the class in a reflective activity to review main ideas or common misconceptions about engineering.

Activity Description: Each student will be provided stickers/sticky notes (if you want to do research with this activity put a number on them), and will be prompted to individually think about up to 7 prompts about engineering. Students will place their sticker on a line somewhere between strongly disagree and strongly agree to correspond with their response to the prompt.

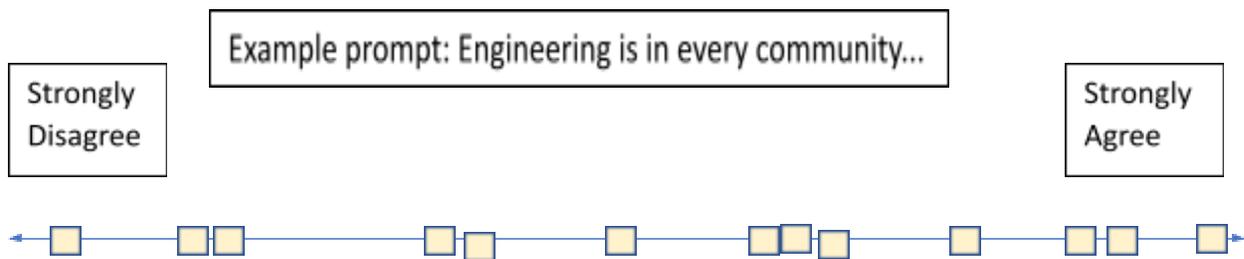
Intended Age: Upper elementary - lower high school **Time Needed:** 30 minutes - 1 hour

Activity Steps:

1. Provide students with stickers or sticky note(s) for the activity.
2. Provide a prompt to the entire class and ask students to think about how much they agree or disagree with the statement
3. Ask students to come to the board and place their sticker on the line (can be on poster/ white board) where they feel is most appropriate.
4. Once all stickers have been placed, have students discuss their thoughts in small groups or as a class.

Prompts:

1. Engineering is in every community and makes a difference in people's lives.
2. Everyone can do engineering.
3. Engineering involves creativity, curiosity, and imagination.
4. Engineers work with many types of people to understand problems and create solutions.
5. Engineers rely on knowledge from multiple subjects to understand as much as they can.
6. Solving engineering design problems requires compromise and trade-offs.
7. Engineers learn from their mistakes because mistakes are normal and important.



Potential Discussion Questions:

(After prompt 1) Give an example of engineering in your community.

(After prompt 1) What's a way that engineers can make a difference in people's lives?

(After prompt 3) How do engineers use creativity or imagination?

(General - after any prompts) Why did you respond the way you did?

Materials: Teachers will need the following:

1. Stickers or sticky notes (Number of Students x Number of prompts)
2. Spectrum from "Strongly Disagree" to "Strongly Agree" on white board / poster

Applicability of the Activity:

The reflective activity described in the first page of this handout is not specific to a particular grade level because it addresses broad conceptions of engineering and common misconceptions that span from childhood through adulthood. The range of grade levels provided is more specific to the type of activity and the complexity of the prompts. We believe that the prompts are a bit too advanced for lower elementary levels and the activity may not be as favorable to upper high school level students, but teachers should ultimately decide the suitability for their students. This activity has been previously conducted and favorably received with students in 6th - 8th grade. These middle school students had been engaging in engineering activities and discussions regularly for one or more semesters, but this activity can also provide meaningful discussion for students who haven't actively engaged with engineering.

Recommendations for Practice

This activity is intentionally designed so that teachers with any background in engineering, ranging from no background to an engineering expert, can implement and support this activity in the classroom. Teachers that have little background or experience working with engineering and feel less comfortable discussing it can place more responsibility on the students throughout the discussion of the themes and use critical thinking prompts to further student thinking. Teachers who are more comfortable with engineering can directly address any misconceptions that students may have about engineering by providing examples that students can think about in more detail. Teachers can also choose their prompts strategically based on content they are currently teaching, or topics they feel more comfortable discussing with the students.

Recommendations for Research

If you would like to use this activity for research, using a poster with stickers or capturing photos of the completed prompts on the white boards as pictures can be a good way to maintain the data for use in your research. If you have an interest in tracking individual students, you can assign students a specific number (i.e. Morgan is number 16) and all of their sticky notes or stickers will have the number 16 on them. This can help identify which students are rating prompts in particular ways - such as how does an individual student vary in their responses from prompt to prompt and what does this indicate about their perceptions of engineering. In conducting our research, we maintained student number assignment on class rosters and you can see a photo of a blank poster with four spaces for prompts and the completed activity for one of the prompts where we captured student responses to “Everyone can do engineering.”

Teacher Name
Class Period
Date

Strongly Disagree Strongly Agree

Strongly Disagree Strongly Agree

Strongly Disagree Strongly Agree

Strongly Disagree Strongly Agree

