

Draw an Engineer

Expand student thinking about what an engineer does and who can be an engineer

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Grade Level: K-12

Subjects: STEM & Art

Duration: Prep: 5-10 minutes Activity: 30-50 minutes (can be shortened as necessary)

Setting: Classroom

Objectives:

After completing this activity, students will:

- Have experience explaining their ideas about what an engineer does and who becomes an engineer.
- Expand student thinking about what an engineer does and who can be an engineer.

Focus Questions: What does an engineer look like? What does an engineer do?

Materials:

Notebook or paper

Pencils

Colored pencils or markers

Background for Educators

This activity is based off of research originally conducted by Dr. David Wade Chambers (1983) in which students participated in the “Draw a Scientist Test” (DAST) and the original “Draw an Engineer Test” was created in Knight and Cunningham (2004). With the inclusion of engineering standards and practices in the Next Generation Science Standards (NGSS) it is important that students begin to reflect on their understanding what engineers do and preconceived notions what kind of people pursue this field as a career.

What do your students imagine an engineer *does*? Who is an engineer, according to your students? Who has the ability to become an engineer? There has been a significant amount of research conducted on how students perceive what doing science looks like, with the most common drawings being of a Caucasian man in a white lab coat (commonly with crazy hair), working alone in a chemistry lab (Finson, 2002). While there has been less research on student perceptions of engineers and engineering careers, it has been found that students typically view engineers as male train operators, laborers who fix and build structures and vehicles, a technician who fixes electronics, or someone who designs things (Knight & Cunningham 2004; Capobianco et al., 2011).

An important first step in shifting these perceptions is to become aware of your students' currently-held beliefs around what an engineer is and does. Building an awareness of students' views is important for educators in deciding where to spend time and what to focus on with students. It can also be eye-opening for students to consider their own biases around who can be an engineer, and the possible impacts of those ideas on how they view science and their relationship to the subject.

Teacher Prep: Gather drawing materials and have them available to students

Introduction

- Introduce the drawing prompt: *Draw an engineer at work. What does an engineer look like? What does an engineer do?*
- Encourage the students to take 1-2 minutes to think before they start to work.

Activity (15+ minutes)

- Give students at least 15 minutes to draw. Giving more time may depend on your students and your schedule.
- Once students have completed their drawings have them flip the page over and write a description of what they drew.

Gallery Walk (5-10 minutes)

- Have students display their drawings on their desks or around the room.
- Inform students of how much time they will have to view all of the drawings
- (Optional) Give this prompt to guide student observations: What do you notice about the engineers in the drawings? What do you wonder?
- Encourage students who don't feel finished to share what they have. You may want to remind students that the purpose is to observe how others interpreted the prompt, not to critique artistic style or ability.
- Invite students to walk around, asking them to be sure to look at every drawing. Be sure to participate with your students.

Discussion/Wrap-up (10+ minutes)

- Ask the students to share what they notice or wonder about the drawings.

Discussion prompts:

- What do all (or many) of our pictures have in common?
- What is missing from our drawings?
- Did anything surprise you?
- Did anything stand out to you?

Possible extension:

- Show students' images of engineers in a variety of disciplines (i.e. computer, chemical, software, etc). Similarly ensure that people that are pictured represent a diverse group of individual (i.e. race, ethnicity, gender).
- You may want to structure this discussion as a Think-Pair-Share:

Think (~1 min) – Individual students think about 1-2 of these questions. Encourage them to jot down their thoughts if that's helpful in organizing them.

Pair (~2 min) – Turn and talk with a nearby student. You may want to structure this by reminding students to switch at a certain time, giving both students time to share.

Share – Invite students to share out with the whole group.

Extension and possible next-steps:

Revisit and compare: Reserve time later on in the school year to do this activity again, and include an opportunity for students to compare their drawings from the beginning of the school year to their new drawings. This is an opportunity for students to assess their own changing understanding of what engineering is, and for teachers to better understand how student beliefs are changing over time. It also allows student drawings to be assessment tools for the teacher to better understand how students' beliefs are changing.

References:

Capobianco, B.M., Diefes-Dux, H.A., Mena, I., & Weller, J. (2011). What is an Engineer? Implications of Elementary School Student Conceptions for Engineering Education. *Journal of Engineering Education*. 100(2), 304-328.

Finson, K.D. (2002). Drawing Scientist: What We Do and Do Not Know After Fifty Years of Drawings. *School Science and Mathematics*, 102(7), 335-345.

Knight, M., & Cunningham, C. M. (2004). Draw an Engineer Test (DAET): Development of a tool to investigate students' ideas about engineers and engineering. Presented at the ASEE Annual Conference & Exposition, Salt Lake City, UT.