Lesson 7: You Can Do It

Disproving preconceived notions students may have about what a scientist, technologist, engineer, or mathematician looks like or the specifics of the profession is an essential component of this curriculum. This lesson emphasizes that with passion and perseverance, anyone can become an engineer, scientist, pilot, et cetera. Students will work in small groups to complete an activity then come together as a class to see how each of their specific roles contributed to the completion of the project.

Learning Objectives

Students will

- Self-identify as successful engineers (whether they liked the activities or not, they completed them and proactively solved problems as individuals and as part of a team)
- Learn that anyone can be an engineer
- Identify the skills necessary to become an engineer
- Understand that many different types of engineering careers exist

Materials

- Markers
- Butcher paper or several posters
- One computer for each pair of students

Time

1 hour

WELCOME AND CHECK IN (5 MINUTES)

Ask students what their favorite experiment was and why. If they were to conduct the activities again, what is one improvement that they would make?

PART I: WHICH ENGINEER? (15 MINUTES)

Consider what kinds of engineers would be needed to create the space station, a bridge, or a car. Print out the titles and brief job descriptions of these engineers for students. Assign the engineering roles to the students.

Tell students to find 3–4 other engineers to form a team. No engineering role should be repeated in any group. For example, one team could have a structural engineer, a propulsion engineer, and a mechanical engineer but no more than one of each.

After students have formed groups, they have 15 minutes to plan how to build something together. They can use the internet to search for something they would like to build. Students do not necessarily have to build an aerospace apparatus. Encourage them to think about other structures, machinery, tools, or products that would require the knowledge of the specialized engineers in their group. If applicable, they can

print out an illustration of their desired project or have a specific engineer on their team draw an illustration of their project.

For example, here are some engineering roles that would be necessary to build the space shuttle:

- Mechanical engineers work on the mechanical components or systems and the design of specific parts of the aircraft. They would be employed to work on the engine, wings, landing gear, and more. Any component of the craft with moving parts was probably designed by a mechanical engineer.
- Structural engineers work on the design of the wings and body. They are responsible for making sure that the spacecraft can support itself and withstand the stress, temperature, and speed of leaving the atmosphere and traveling in space.
- Propulsion engineers work on the engine. It is their job to design engines that create enough power and thrust to get the space shuttle into space. They make sure that the aircraft has enough fuel for its trip without being weighed down by carrying unnecessary fuel that won't be used.
- Aerodynamics engineers make sure that the aircraft is designed to create the least amount of drag possible as it moves through the air and fights against gravity. They will work to make sure the wings, airfoil, and overall design are optimized for maximum aerodynamic travel.
- Guidance, navigation, and control engineers develop the systems that are used to control the shuttle's movement. These electronic systems can control the velocity, acceleration, path, and rotation of the space shuttle. In addition, these engineers can develop thrusters or steering mechanisms to help keep the spacecraft on course during flight.
- Electronic instrumentation and communication engineers develop and design the technology that communicates space shuttle information to the pilots onboard. For example, if the pilot wants to check the fuel, velocity, temperature, or health of the spacecraft, they would use the instrument panel. The tools developed by these engineers also allow pilots to communicate with people on the ground.

PART II: ENGINEER BIO (20 MINUTES)

After all members of each group have successfully identified what role their engineering specialty plays in their team project, they will begin their research. Give students 10–15 minutes to conduct online research of an individual currently working as the type of engineer they had selected in their team project.

If students need some guidance, prompt them to find the answers to the following questions:

> Education: Where did they go to school? What did they major in, and what degrees did they earn?
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> Career: What motivated your engineer to get involved in her or his career? Were they always on the same career path?
>
> Training: What special skills has your engineer developed? What are some extra trainings or certifications that helped them on their career path?
>
> Work responsibilities: Can you describe a typical workday for your engineer?
>
> Fun: What do they like to do when they aren't working?

NASA and other space exploratory organizations are good places to start looking for role models if students decided to build an aerospace project. Instruct them to find out as much information about this person as possible on their work website, LinkedIn, or online articles. Each group will give a 2–3 minute presentation on their engineer to the class.

After all groups have finished, call up each group individually to present their project and the individual engineers whom they researched. Students should be able to explain the role that their engineering specialty would play in the team project.

Give students 2–3 minutes to present their project and the individual engineers. They should explain how this person's engineering expertise would be an asset to the creation of the vessel, structure, or mechanism that they built.

PART III: WHAT IS AN ENGINEER? (20 MINUTES)

> Who and what is an engineer? How would you explain what an engineer does? What kind of person becomes an engineer?

Encourage an active discussion with the class. You can write down adjectives that students call out to describe engineers.

> If you have time, consider closing the lesson by showing students clips of diverse STEM professionals. It is important for boys and girls to see diverse examples of female STEM professionals to prepare to work in diverse environments and champion a more equitable STEM future.

Guiding Discussion Questions

- How has your idea of an engineer changed? Why?
- Can you explain the difference between an aeronautical engineer and a mechanical engineer?
- What other projects might require teams of engineers who work on different components?
- What is one way that you used or benefitted from engineering today?