SIEMENS STEM DAY
Science
Technology
Engineering
Math

GRADES 9–12

SIEMENS STEM DAY ACTIVITY

ENGINEERING FIELDS

OBJECTIVES

Students will be able to:

- **understand** that engineers design, develop, and manufacture goods and services to benefit society.

- **identify** and **describe** the responsibilities of several different types of engineers.

- **analyze** two engineering fields and explore their interdependence.

- **collaborate** by working to improve a specific good or service.

THIS LESSON FOCUSES ON

Engineering Design Cycle

- Refine or Improve

- Communicating Results

21st Century Skills

- Collaboration

- Communication

- Critical Thinking

- Creativity

OVERVIEW

There are many different fields of engineering. In this activity, students will learn about the vastness of the engineering profession by completing 2-3 engineer career profiles. Then they will specialize in two engineering fields that would need to work collaboratively to improve a specific article or service. This will provide students exposure to different career paths associated with engineering and the interdependence of the engineering field.

STEM incorporates Science, Technology, Engineering, and Mathematics to focus on real-world issues and problems guided by the engineering design process. This type of instruction supports students in developing critical thinking, collaboration, reasoning, and creative skills to be competitive in the 21st-century workforce.

Each Siemens STEM Day classroom activity highlights one or more components of the engineering design cycle and an essential 21st-century skill.

MATERIALS

- *Interdependence of Engineering* handouts, *one per student*.

- *Interdependence of Engineering: Follow-Up Questions,* one per student.

- Computers with internet access for research.

HAVE YOU EVER WONDERED . . .

Which career would I most enjoy in the Informational Technology field?

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MAKE CONNECTIONS!

How does this connect to students?

STEM education is at the forefront of creating successful life-long learners. Engineering is a critical component of providing a high-quality education that engages learners beyond the traditional classroom.

One of the main goals of any field of engineering is solving problems. Encouraging students to stretch their curiosity, grow their creativity, apply principles of logic and practice organizational skills is essential. These tools are valuable necessities when engaging in the **engineering design process.**

How does this connect to careers?

"Engineering is similar to the medical field in the sense that you don't just simply choose to be an "engineer," just like you don't simply choose to be a "doctor." You have to **pick a specialty**, as there are many different types of engineering jobs. This naturally gives rise to the question: 'how many types of engineers are there?'"[1]

How does this connect to our world?

The **UN Sustainable Development Goals** address global challenges that we face. To solve many of these real-world problems, a great deal of engineering is often applied in order to combat poverty, climate change, environmental degradation and much more.[2]

The **future technological advancements** that engineering will achieve are inconceivable. Innovation and engineering hold the key to a better tomorrow for all.

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[1] Engineering Careers: 33 Different Types of Engineers and Salaries, https://careerkarma.com/blog/engineering-similarities-and-differences/
[2] Sustainable Development Goals, https://www.un.org/sustainabledevelopment/sustainable-development-goals/

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BLUEPRINT FOR DISCOVERY

1. To involve students in achieving the lesson's objectives, write the word "engineering" on the board and ask students to share the first thoughts that come to their mind. Record these ideas on the board. Listen closely to see if any student identifies "solving problems." If not, explain to the students that although there are so many different fields of engineering, they all focus on problem solving.

2. Explain to students that they are going to have the opportunity to select 2–3 fields of engineering to research. Ask the students to turn to a partner and try to list as many different engineering careers as they can. Here is a comprehensive list for your reference:.

   - Aerospace
   - Agricultural
   - Automobile
   - Biochemical
   - Biomedical
   - Materials
   - Chemical
   - Civil

   - Computer Hardware
   - Computer Systems
   - Electrical
   - Environmental
   - Geological
   - Industrial / Manufacturing
   - Marine
   - Mechanical

   - Mining
   - Nuclear
   - Petroleum
   - Robotics
   - Software
   - Structural

3. Instruct the students to select 2–3 of the engineering fields that they'd like to research. Pass out 2–3 copies of the **Career Profile Template** to each student. Students will need access to the internet to gather information on their selected careers. Encourage the students to use the following resources:

   - https://www.nacme.org/types-of-engineering
   - https://www.youtube.com/watch?v=fT7LTaGzcok
   - https://careerkarma.com/blog/engineering-similarities-and-differences/

   Note: If students do not have access to devices that can access the internet, it would be helpful to play the video listed above for the whole class. Also, you may choose to print the other resources.

4. Tell the students that they are now going to become a part of an engineering partnership to work collaboratively to improve a specific article or service. This will provide students exposure to different career paths associated with engineering and the interdependence within the engineering field. For example, one student might select to be a mining engineer and his/her partner might choose to be a chemical engineer. Pass out one copy of the **Interdependence of Engineering** handouts to each student along with the **Interdependence of Engineering: Follow-Up Questions**.

5. Remind students that their goal is to select a good or service that these two engineers would work on together. It is important that students understand the interdependence within the engineering field. Before they start working, it might be necessary to explain the meaning of interdependence. As the students work on the activity, circulate the room to answer questions. Some partner sets might need assistance getting started with this activity. Keep track of the amount of work time you provided for the students and give them periodic time updates.

6. Once students have finished their activity, instruct them to complete the **Interdependence of Engineering: Follow-Up Questions** with their partner. Conclude the lesson by facilitating a sharing session in which the partner sets explain to the class their service or good improvement and the role they each played in the process.

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TAKE ACTION!

- Encourage students to visit the UN Sustainable Development Goals website https://www.un.org/sustainabledevelopment/sustainable-development-goals/ and select a few goals to read about to gain more information. Then ask students to select one goal and consider the role that various engineers could play in helping to accomplish that goal.

NATIONAL STANDARDS

Standards for Technology Literacy	Standard 3: Students will develop an understanding of The Nature of Technology. This includes inquiring a knowledge of the relationship among technologies and the connections between technology and other fields.
Next Generation Science Standards	SEP 7: Engaging in Argument from Evidence

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CAREER PROFILE TEMPLATE

Type of Engineer:	
Job Description:	**Required Education / Training:**
Job Responsibilities:	**Skills Needed:**

How does this career impact the world?	How does this career impact the world?	2–3 Interesting Facts:

Job Outlook:	Salary Range:

INTERDEPENDENCE OF ENGINEERING

Describe the *article* or service to be improved:

Describe the desired improvements:

Describe below what each engineer is responsible for contributing to this improvement.

_____ **Engineer**   _____ **Engineer**

+

Describe the desired improvements:

INTERDEPENDENCE OF ENGINEERING: FOLLOW-UP QUESTIONS

1. What does interdependence mean?

2. How did this activity demonstrate the interdependence between the two engineers?

3. What were the two most important skills used by the engineers as they collaborated together?

4. What are two questions that you would ask each engineer?

_____ **Engineer**   _____ **Engineer**

1.	2.

5. What did you find most interesting about this activity?