

Lesson Title	8. Engineering and Design Processes that Biomedical Engineers Use
Lesson Designer	Catherine Piscitelli
Standards	<input checked="" type="checkbox"/> CCSS <input checked="" type="checkbox"/> NGSS <input type="checkbox"/> ASCA <input type="checkbox"/> Other CCSS.ELA-LITERACY.RST.9-10.9 Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. 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.
Learning Objectives	Students will be able to: <ul style="list-style-type: none"> • Define what the engineering and design process is and what it is used for • Contrast how the process differs from the scientific method • Explain the specific steps in the engineering and design process • Apply the engineering and design process to solve a medical need

Timeline	Duration
Opening Activity Learning Activity Application Learning Task	90-minute lesson (or one 60-minute and one 30-minute lesson)

Teaching Strategies/Student Actions	Monitoring
1. Opening Activity: Teacher asks opening question, <i>“Most of us are very familiar with scientists but what are engineers and how are they different from scientists?”</i> Students read article and then answer a question. 2. Learning activity: Teacher uses the chart to review the steps of the scientific method. Students read website to learn the steps of the engineering and design process. Students make a Venn diagram to compare and contrast the scientific method and the engineering and design process. 3. Application: Students use a chart to explain how biomedical engineers would work through the engineering process when faced with the real-world issue presented.	<ul style="list-style-type: none"> • Teacher monitors student progress • Teacher facilitates discussion of correct answers to Venn diagram • Teacher questioning during review • Teacher monitors student progress on application task

Product Description	Students will use their application skills and new knowledge to apply the engineering and design process to a biomedical engineer’s methodology.
Evaluation	Teacher evaluates the application chart to assess that the student understands the engineering and design process.

Resources and Materials	Additional Notes
<ul style="list-style-type: none"> • Web article • Scientific method chart • Scientific Method vs Engineering and Design Process Venn diagram • Application table 	

Teacher Resource Guide

Introduction

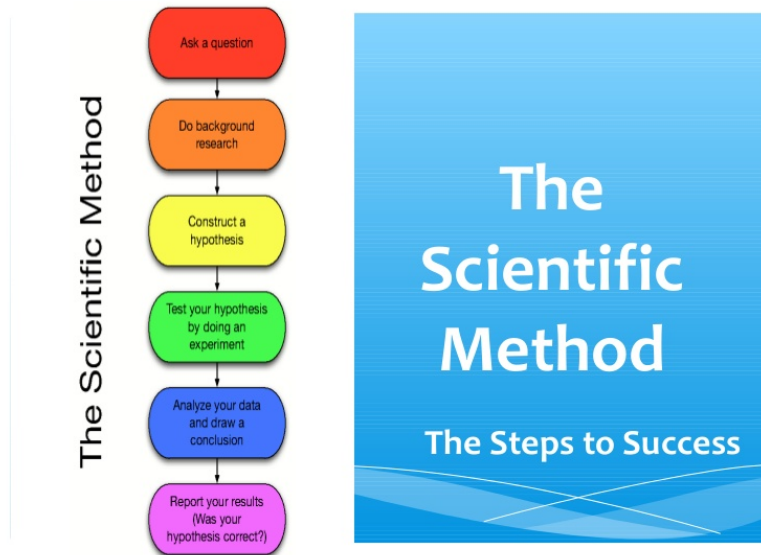
A biomedical engineer is a professional that uses the engineering process to design or enhance existing medical devices, instruments, and software. They often work in conjunction with medical professionals and other engineers during their design process. In order to complete their task, engineers follow a specific progression of steps which looks a bit different from the typical science research or scientific method.

Opening Activity- What is the difference between a scientist and an engineer?

1. Pose the following question: *Most of us are very familiar with scientists but what are engineers and how are they different from scientists?*
2. Students read the following article: <https://www.stemjobs.com/whats-the-difference-between-a-scientist-engineer/>
3. Pose the follow up question: *What did you learn from the article?*

Learning Activity

1. Review the steps of the scientific method.



2. Use the following website to read about the steps of the Engineering and Design Process. <https://www.teachengineering.org/design/designprocess+>
3. Have students complete the Venn Diagram

Application

Present the following Learning Task to students:

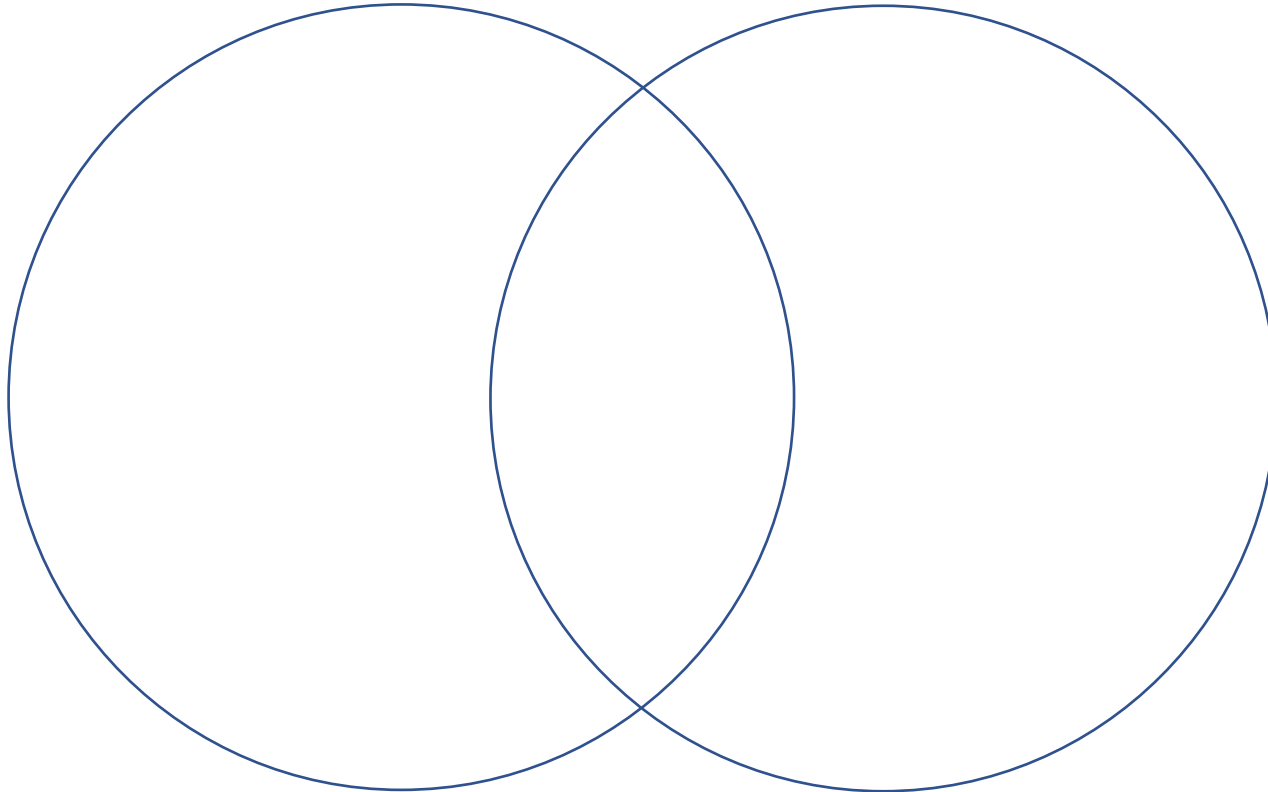
A biomedical engineer is challenged with the task of creating a more efficient microscope to aid in the implantation of a cochlear device. Using what you have learned about the engineering process, complete the following chart to describe the process the biomedical engineer must go through.

Students complete the chart to explain steps.

Create a Venn Diagram

Directions: Using what you learned, complete the following Venn diagram. Use sources from the Internet for additional information. Record your sources (websites/ links) underneath the Venn diagram.

Scientific Method vs Engineering and Design Process



<p>Sources:</p>	
-----------------	--

Engineering and Design Process Challenge

A biomedical engineer is challenged with the task of creating a more efficient microscope to aid in the implantation of a cochlear device. Using what you have learned about the engineering process, complete the following chart to describe the process the biomedical engineer must go through.

Step in the Engineering and Design Process	Explanation