SIEMENS STEM DAY | Science Technology Engineering Math

SIEMENS STEM DAY ACTIVITY

MODELING DIABETES

OBJECTIVES

Students will be able to:

- **Understand** the causes of type I and type II diabetes and how a person's life is affected by the disease.
- **Build** models that demonstrate how insulin allows glucose to enter cells, and how this process is compromised in people with diabetes.

THIS LESSON FOCUSES ON

Engineering Design Cycle

- Creating or Prototyping

21st Century Skills

- Collaboration
- Creativity

OVERVIEW

Diabetes is one of the most common diseases facing Americans. Students will learn what causes type I and type II diabetes and investigate what is happening in the body of a person who has diabetes, including the function of the pancreas in insulin production and how insulin allows for glucose to enter cells. Students will work in groups to create a working model that can show how insulin allows glucose to enter a cell in a typical person and how that process is compromised in a person with diabetes. Groups will demonstrate how their respective models work and give feedback on the models of their peers.

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

- Computer with internet access
- **Diabetes Notes Student Handout**—one per group
- Various craft supplies such as:
  - pipe cleaners
  - cardboard
  - hot glue sticks
  - hot glue guns
  - modeling clay
  - dry pasta
  - construction paper
  - plastic straws
  - yarn or string
  - colored paper

HAVE YOU EVER WONDERED . . .

What are the causes and symptoms of diabetes?

MAKE CONNECTIONS!

How does this connect to students?

In the past, type II diabetes was a disease that was mostly seen in people over the age of 40. However, in recent years the incidence of diabetes in teens and children has been increasing rapidly. The American Diabetes Association reported in 2017 that 193,000 Americans under age 20 are estimated to have been diagnosed with diabetes. As diabetes in young people continues to increase, the importance of education about the link between diet, exercise, and diabetes increases as well.

How does this connect to careers?

Dieticians provide medical nutrition therapy for patients. They develop, implement, and monitor nutrition programs and confer with doctors and health care professionals to help manage the health of patients.

Endocrinologists specialize in monitoring patients' hormone levels and diagnosing hormonal issues. They prescribe medication, create treatment plans, and monitor patient's hormone levels, adjusting treatments as needed.

Pharmacists dispense medications, counsel patients on the use of medications, and advise physicians about medication therapy.

Exercise physiologists analyze their patients' fitness and create and monitor fitness plans in order to help them maintain or improve their health.

How does this connect to our world?

In 2014, the World Health Organization reported that there were an estimated 422 million people globally that had been diagnosed with a form of diabetes, with the greatest increase in middle and low-income countries. It is important that diabetics have access to quality healthcare and medications, and while not all types of diabetes are preventable, education about a healthy diet and lifestyle may help to slow the increase in new diagnoses and help those with diabetes live longer, healthier lives.

BLUEPRINT FOR DISCOVERY

1. To introduce the topic of diabetes to students, show the following short video clips:

   Type 1: https://youtu.be/9tvD2sMl9hI and

   Type 2: https://youtu.be/oDOVXww7sSE

2. Facilitate a discussion in which students compare and contrast the two types of diabetes.
3. Explain to students that they will work in groups to research the differences between type I and type II diabetes and create 3-D models that can be used to show what is happening in the body of a person with the disease.
4. Divide students into groups of 4. Give each group a copy of the **Diabetes Notes Student Handout.** Direct students to use the links provided to conduct their research and complete the Venn Diagram.
5. Reinforce that diabetes is caused by the failure of the body to produce sufficient insulin that is essential in allowing the cells to get the sugars that they need. If necessary, emphasize how insulin produced by the pancreas allows glucose to enter cells to be used for energy and lower blood glucose levels, as demonstrated in this video: https://www.youtube.com/watch?v=OYH1deu7-4E.
6. Challenge students to use craft supplies to create a model that can be used to show what is happening in the body of a person with diabetes. Their model should be able to be used to show how insulin allows glucose into cells, and what happens when there is not enough (or any) insulin present. Remind them to consult their research to inform their design.
7. Provide an opportunity for each group to present their model to another group or the entire class. Encourage students to provide feedback to their peers. If time allows, direct students to revise their design based on feedback.

TAKE ACTION!

- Students can research current and upcoming products/medications available that can help people with diabetes manage their disease.
- Students can use or modify their model to show how products/medications offered for diabetes care would work at a cellular level.

NATIONAL STANDARDS

Science	HS-LS1-2 Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms http://www.nextgenscience.org/
Technology Education	**4c** Students develop, test and refine prototypes as part of a cyclical design process. **7c** Students use digital tools to broaden their perspectives and enrich their learning by collaborating with others and working effectively in teams locally and globally. https://www.iteea.org/File.aspx?id=67767&v=b26b7852

ADDITIONAL RESOURCES

http://www.diabetes.org/diabetes-basics/statistics/

https://www.nih.gov/news-events/news-releases/rates-new-diagnosed-cases-type-1-type-2-diabetes-rise-among-children-teens

http://www.diabetes.org/living-with-diabetes/treatment-and-care/whos-on-your-health-care-team/your-health-care-team.html

https://explorehealthcareers.org/

https://www.who.int/news-room/fact-sheets/detail/diabetes

http://www.diabetes.org/diabetes-basics/type-2/

http://www.diabetes.org/diabetes-basics/type-1/

DIABETES NOTES

Use the following links to help you complete the table that compares type I and type II diabetes.

Type I diabetes: http://www.diabetes.org/diabetes-basics/type-1/

Type II diabetes: http://www.diabetes.org/diabetes-basics/type-2/

	TYPE I DIABETES	**TYPE II DIABETES**
Onset (Gradual or Sudden?)		
Type and age of people most commonly affected?		
Does the body produce insulin?		
Symptoms		
Cause(s)		
Treatments		

Use the information in the table to complete the blank Venn Diagram below.