

Biomaterials

Grades: 2nd grade - 4th grade

NGSS: K-2-ETS1 Engineering Design, K-2-ETS1-2 Engineering Design, 3-5-ETS1-2 Engineering Design

Materials: *Women in Engineering / Las mujeres en la ingenieria*, Build a Biomaterial worksheet

Skills: scientific drawing

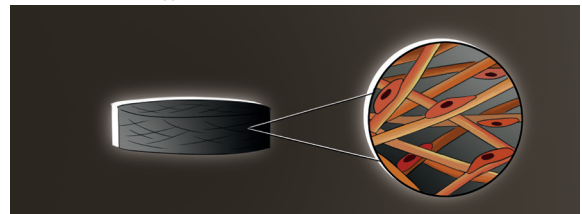
Subject: Biomaterials, biomedical engineering

BACKGROUND

Some engineering feats are easy to see. We can observe how bridges are both functional and fantastic structures. But there are also incredible inventions that are used inside the human body to save people's lives. Over time, engineers have developed synthetic, or human made, materials that can replace organ tissue or even to help construct new bones. Biomaterials are briefly touched upon in *Women in Engineering / Las mujeres en la ingenieria*, but this activity further explores the diversity of engineering in a medical context.

ACTIVITY

1. Read *Women in Engineering / Las mujeres en la ingenieria* out loud to your class.
2. Discuss Dr. Treena Livingston Arinze's work with adult stem cells with the class.
3. Further explain her work through descriptions of biomaterials and the ways these special materials interact with your body safely, and help heal any wounds, or help your body function better.
 - a. Expand on the many different kinds of biomaterials. Here are a few:
 - i. Sutures, clips, staples: Materials used to repair broken or torn skin, or surgical incisions.
 - ii. Blood glucose monitoring devices: An easy machine that monitors glucose, mostly used by people with diabetes to monitor their health.
 - iii. Pacemakers: A machine placed inside the body that helps someone maintain a regular heartbeat.
 - iv. Joint replacements: Replacing a damaged joint with an artificial one so that a person can continue to easily use that joint.
 - v. Heart valves: Artificial tissue replacement that can replace someone's old or damaged heart valve.
 - vi. Contact lenses: Small, plastic lenses people wear in their eyes to help their vision, instead of wearing glasses.
 - vii. Hearing aids: Devices placed in the ear to assist people with hearing loss.
 - viii. Dental implants: These are implants for the teeth that can help someone chew, replace lost teeth, or change their jaw structure.



Biomaterials Continued

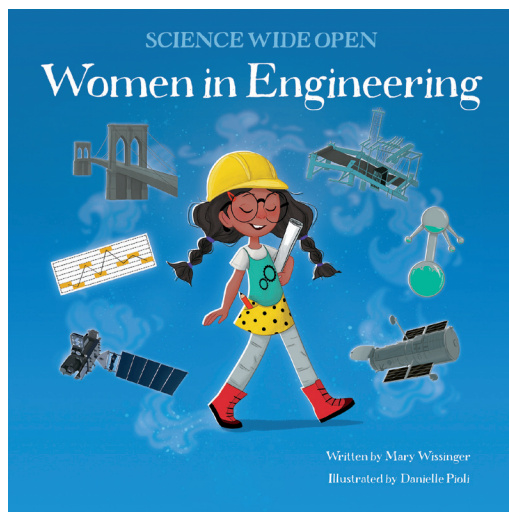
ACTIVITY

- ix. **Braces:** Small metal pieces that are attached to teeth to change their shape. Often used to change someone's appearance, but also helpful for chewing and jaw structure.
 - x. **Stents:** An artificial tube that is used inside of the body to hold passageways open, such as repairing clogged or damaged arteries.
 - xi. **Hydrogels:** Materials that are used in different types of biomaterials to make them water-insoluble. Some examples include contact lenses, wound dressing, and various hygiene products.
- b. Discuss how these examples of biomaterials can use different materials, such as titanium, silver, silicone, plastic, and even artificial tissue.
 - c. Discuss whether or not the students have ever been in contact with biomaterials. Maybe they know someone who has one, or have one themselves.
4. Print out the worksheet for your students to draw, annotate, and write notes on. Using the knowledge they know from discussing the examples of biomaterials above, they can try to create their own biomaterials.

DISCUSSION

Discuss the different types of biomaterials students created. Were any inspired by the biomaterials you discussed? How do they improve the body or make someone healthier? Encourage students to think about these biomaterials might be created. Would they use metal, or silicone? Would they be on top of or outside of the body? Compare your students answers to how the engineers behind the biomaterials being used today had to think about everything that might affect the use of the biomaterial. The most important question to ask your students to answer, which all engineers ask themselves, is: what problem are you solving?





This activity was excerpted from the Teacher's Guide to
Women in Engineering / Las mujeres en la ingeniería

English editions:

Hardback ISBN: 978-1-938492-52-5

Paperback ISBN: 978-1-938492-53-2

eBook ISBN: 978-1-938492-54-9

Spanish editions:

Paperback ISBN: 978-1-938492-95-2

eBook ISBN: 978-1-938492-98-3

For more great free educational resources,
visit us at ScienceNaturally.com



Sparking curiosity
through reading

Feedback welcome.

Please send to Info@ScienceNaturally.com

Name: _____

Date: _____

Build a Biomaterial

Design your own biomaterials to help this person stay healthy. Use your imagination, and draw your new biomaterials onto the person below! Plan out your biomaterials by writing notes about the type of material you would use, and what problem you are fixing.

