

Life Sciences Engineering Resources

Below you will find some resources to support you as you start incorporating engineering into your classroom.

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Presentation & Resources from Presentation:

- <http://brookewhitworth.com/lifescienceeng.html>

Engineering Articles from NSTA Journals:

- Boesdorfer, S., & Greenhalgh, S. (2014). Make room for engineering: Strategies to overcome anxieties about adding engineering to your curriculum. *The Science Teacher*, 81(9), 51-55. Available online at: http://static.nsta.org/files/tst1409_51.pdf
- Childers, G., Wolfe, K., Dupree, A., Young, S., Caver, J., Quintanilla, R., & Thornton, L. (2016). Sculpting the barnyard gene pool. *The Science Teacher*, 83(7), 49-54. Available online at: http://static.nsta.org/files/tst107_49.pdf
- Crismond, D. (2013). Design practices and misconceptions. *The Science Teacher*, 80(1), 50-54. Available online at: http://static.nsta.org/files/tst1301_50.pdf
- Razzouk, R., Dyehouse, M., Santone, A., & Carr, R. (2014). Plants v. pollutants. *The Science Teacher*, 81(9), 43-49. Available online at: http://static.nsta.org/files/tst1409_43.pdf
- Wheeler, L. B., Whitworth, B. A., & Gonczy, A. L. (2014). Engineering design challenge. *The Science Teacher*, 81(9), 30-36. Available online at: http://static.nsta.org/files/tst1409_30.pdf
- Whitworth, B. A., & Wheeler, L. B. (In Press). Engineering or not? *The Science Teacher*. Available upon request. Please email: brooke.whitworth@nau.edu

Engineering Websites:

- Center for Innovation in Engineering & Science Education - <http://ciese.org/materials/k12/>
- Children's Engineering - <http://childrensengineering.com/>
- Engineer Your World - <http://www.engineeryourworld.org/>
- Engineering is Elementary - <http://www.eie.org/>
- Link Engineering - <http://www.linkengineering.org/>
- Materials World - <http://www.materialsworldmodules.org/>
- PBS Design Squad: <http://pbskids.org/designsquad>
- Project Lead the Way - <https://www.pltw.org/>
- Teach Engineering - <http://www.teachengineering.org/whyk12engr.php>

Engineering Books:

- Brunsell, E. (2012). *Integrating engineering and science in your classroom*. NSTA Press.
- Moyer, R., & Everett, S. A. (2012). *Everyday engineering: Putting the E in STEM teaching and learning*. NSTA press.

- Moyer, R., & Everett, S. A. (2016). *More everyday engineering: Putting the E in STEM teaching and learning*. NSTA press.
- Stevens, S. Y., Sutherland, L. M., & Krajcik, J. S. (2009). *The big ideas of nanoscale science and engineering*. NSTA press.
- Truesdell, P. (2014). *Engineering Essentials for STEM Instruction: How do I infuse real-world problem solving into science, technology, and math? (ASCD Arias)*. ASCD.

Engineering Tasks:

1. Bird Beak Challenge

Overview: Students design different bird beaks from a set of materials that will be the most effective in picking up a certain type of food. Students can be given different types of food, test their beak, make modifications to improve their beak design, and try it again. Students can share their beak design and data to illustrate the effectiveness of their beak in gathering food.

Concepts: Natural selection and adaptation

2. Biodome Design

Overview: Using their understanding of the biosphere, ecosystems, and community interactions, students design a model biodome of a particular environment. Students are tasked with creating a prototype of a biodome incorporating one climate and one landscape. An international committee will select one as the winner to be built.

Concepts: Biosphere, ecosystems, environment

3. Heart Valves

Overview: Students work to design a working prototype of a heart valve based on their understanding of heart valves and blood pressure. Students research artificial heart valve ideas, sketch a design, and create a model heart valve. Based on testing with red-colored water, students collect data and evidence for making modifications to their model.

Concepts: Anatomy, heart, blood pressure

4. Salinity Design

Overview: Students are tasked with creating a salt water solution that will float different materials at different levels (e.g., one group has to get a wooden block to hover at mid-solution level while another has to get the block to float). Students calculate salt concentrations based on the density of their object and their understanding of density and salinity, test their object in their solution, and revise their solution based on whether they achieved their goal.

Concepts: Density, salinity, properties of water

5. Cleaning the Water

Overview: Students are tasked with finding solutions to meet a community's needs for clean water given the increasing pollution of their water source. Students design filtration systems to clean dirty water, test their filters, and revise their designs based on the results.

Concepts: Water, conservation, contamination, climate change