

2017 NSTA Best STEM Book Elementary Showcase

WHAT WILL YOU BUILD?

Why the Materials We Use to Build Matter

In this STEM Skills lesson plan for Grade 5, teachers utilize the steps of renowned scientist Benjamin Banneker from the book *Ticktock Banneker's Clock* to engage in Project Based Learning (PBL) where students will theoretically, or realistically create and build their own object.

Common Core Standards Alignments:

- **Identify objects** (every day, or extraordinary) that students choose to build
- **Gather information** from experience (their use if any of the object chosen), digital, and print resources of each object to build knowledge and establish theories
- **Develop and build** models
- **Document** findings, organize and share the information

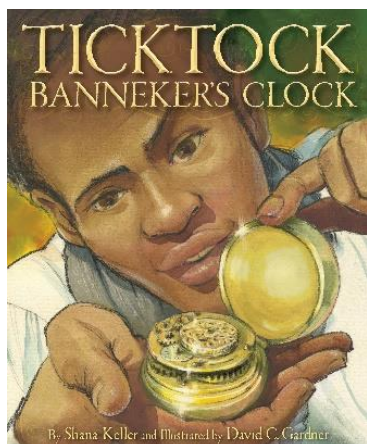
Crosscutting NGSS concepts include:

- cause and effect
- scale
- proportion
- matter
- structure
- function

Students will:

1. Study every day, or extraordinary objects by analyzing the different materials used to build them.
2. Evaluate the most effective materials needed to build their own object.
3. Share their finished project or case study with the class.

Resources & Materials:



- *Ticktock Banneker's Clock* by Shana Keller
- Library of Congress www.loc.gov
- How it's Made
www.sciencechannel.com/tv-shows/how-its-made/
- Sample objects (clock, cup, ice-cream scooper, fidget spinner, lamp, etc.)

Part I.

Identify objects (every day or extraordinary) that students choose to build.

Questions to generate student's exploration:

1. **What will you build?** A rocket? A lamp? A chair? Baneker chose a clock.
2. **What will you build it with?** What materials make sense? Baneker might have liked to use metal for his clock, but that was expensive and rare in the 1700s. He had to get creative!

Part II.

Gather information about the object, whether from experience (their use if any of the object chosen), digital, and print resources. Investigate components of each object to increase knowledge and establish theories.

1. **How will you design your rocket, lamp, chair, bridge, or clock, etc.?**
 - a. Use other objects to gather ideas. Baneker only had access to a pocket watch. He took it apart and used it as the basis for his design.
 - b. *Draw and sketch* your object. Use diagrams and scales if necessary.
 - c. Visit the Library of Congress (www.loc.gov) to explore actual patents and designs such as the toilet paper roll, ice-cream scooper, paper bags, the cotton gin, rockets, seatbelt, shields, etc.
2. **Understand core elements of basic building materials.**

Different materials will yield different results.

 - a. If you build an ice-cream scooper out of clay, would it work well? Would you build a car out of glass?
 - b. What types of ways do people strengthen or 'treat' materials to make them more usable or practical?
3. **Test it out!**

When Baneker first carved his clock pieces out of wood, they broke. He realized the pieces were too flexible because the wood was too moist. Baneker grew tobacco leaves and eventually paired the idea of curing leaves with the idea to cure wood. He had the right material, but he had to 'treat' it to make it work. Could this be the case with your project?
4. **Refine your project.**
 - a. If it didn't work the first time, how can you improve it?
 - b. Was it the materials you used?
 - c. Perhaps the materials need to be more flexible, lighter, stronger, bigger, smaller, etc. Maybe the pieces didn't fit quite right.
Baneker carved gear after gear until all the pieces fit. It took him two years!
Innovators and inventors take their time!

Part III.

Document findings and organize the information.

1. Students will emulate the current platform of knowledge-sharing in today's scientific community by presenting their findings and reports with their class upon completion of the project.
2. Students will have the opportunity to solicit ideas for their own project and offer ideas, if any for other's. And, understand first-hand that most inventors are really innovators.