

STEAMING UP

YOUR LIBRARY PROGRAMS



The Phelps Library is a small, rural library with 1 FT director, 3 part time employees, and a \$2K programming budget, but we are able to offer over 3000 hands-on STEAM programs each year.

CRAFT STEAM

Papercrafts

Object Painting

Beginner's Sewing

Gardening

Wreathmaking

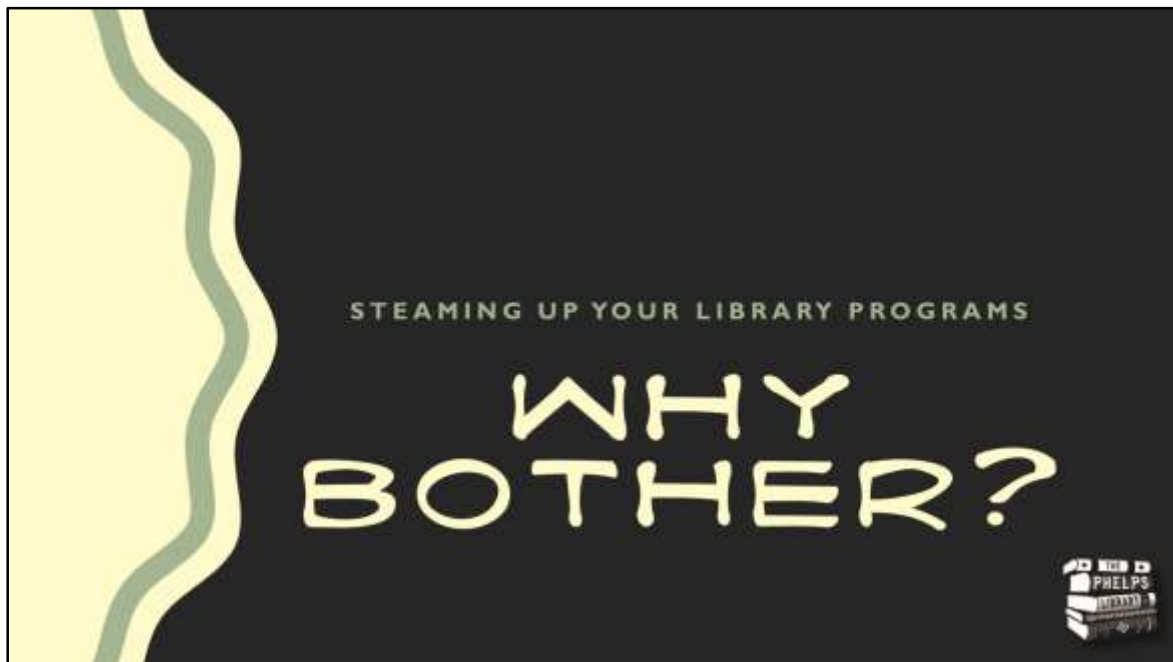
Fermented Foods and

Fiber Dyeing

Cheesemaking



Examples of typical “Craft” programs throughout our library system.



The key word here is WHY.

By teaching the science behind the process and utilizing the engineering process we will discuss in a moment, we are teaching students of all ages lifelong problem solving skills.

Rather than providing the materials to complete a project and tell them to assemble it, we are teaching them how and why to choose those particular materials and why those materials react the way that they do. This gives them the skills to determine solutions when something doesn't work.

PROJECT- BASED LEARNING

(ALSO KNOWN AS PBL)



Project-based Learning: develops deeper learning competencies required for success in college, career, and in the community.

More engaging, Increases knowledge retention, builds success skills. Makes your classes and workshops more enjoyable for presenters and meets the attendees on a personal level. Connects the library to the community by educating students of all ages, especially with intergenerational classes. The way a 7 year old learns and experiences is completely different from a 77 year old, and we can all learn from each other.



And because it's fun!



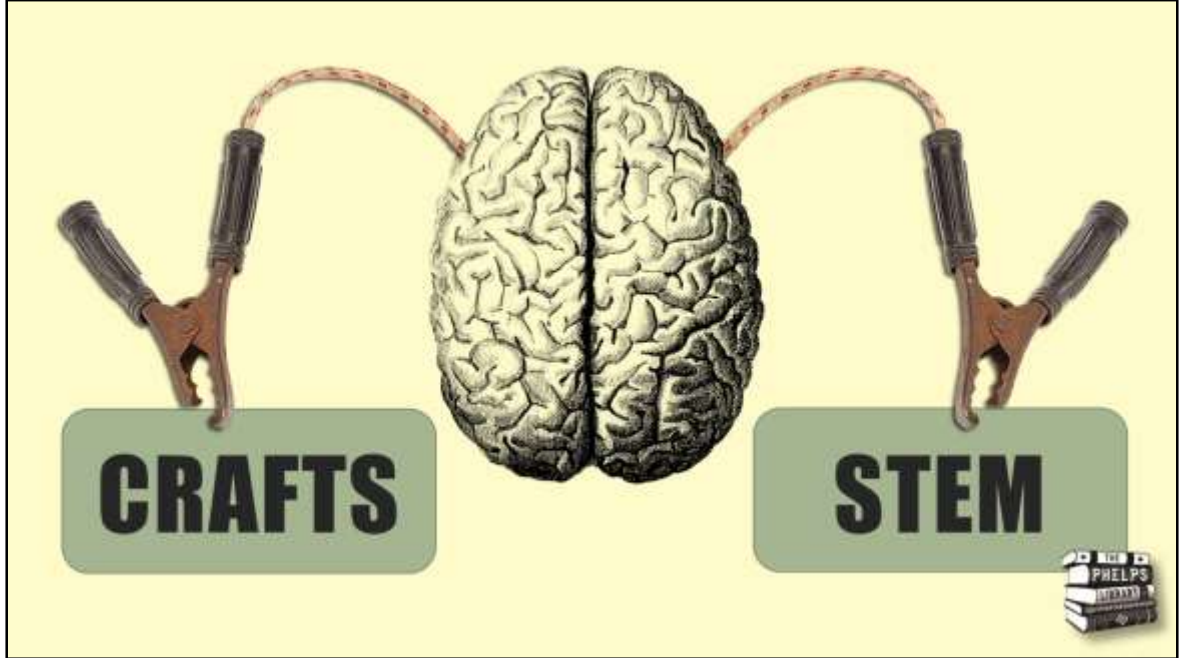
LIBRARIES
ARE
EDUCATION



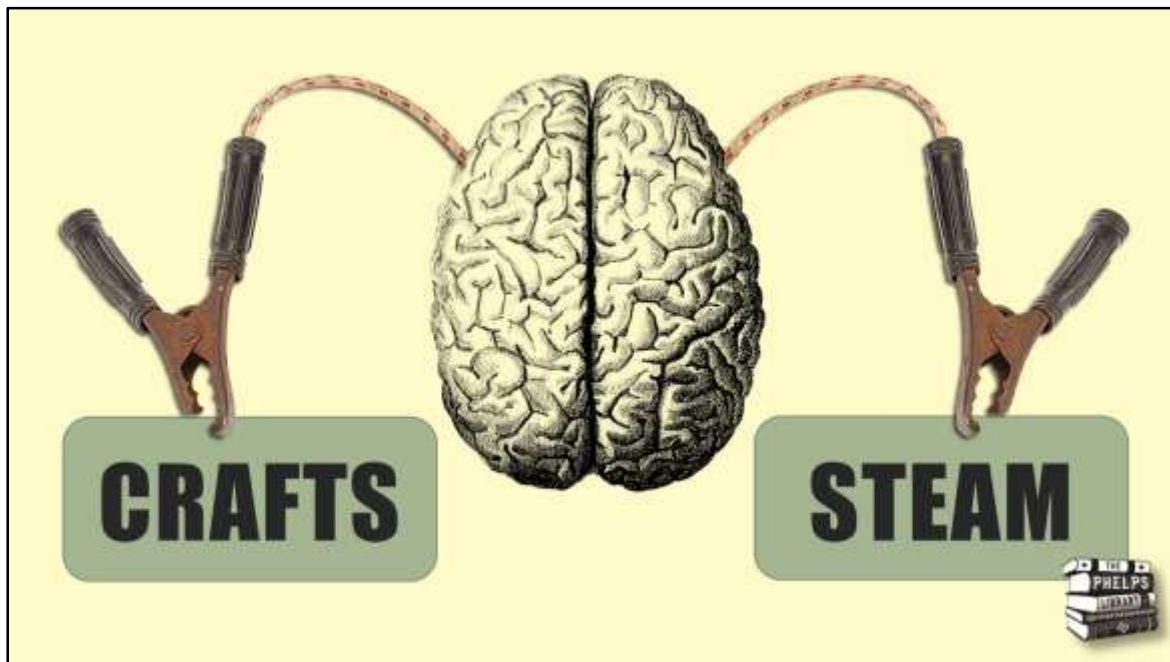
Libraries are educational institutions, chartered by the New York State Education Department. We ARE Educators. Education doesn't have to end when the school bell rings.



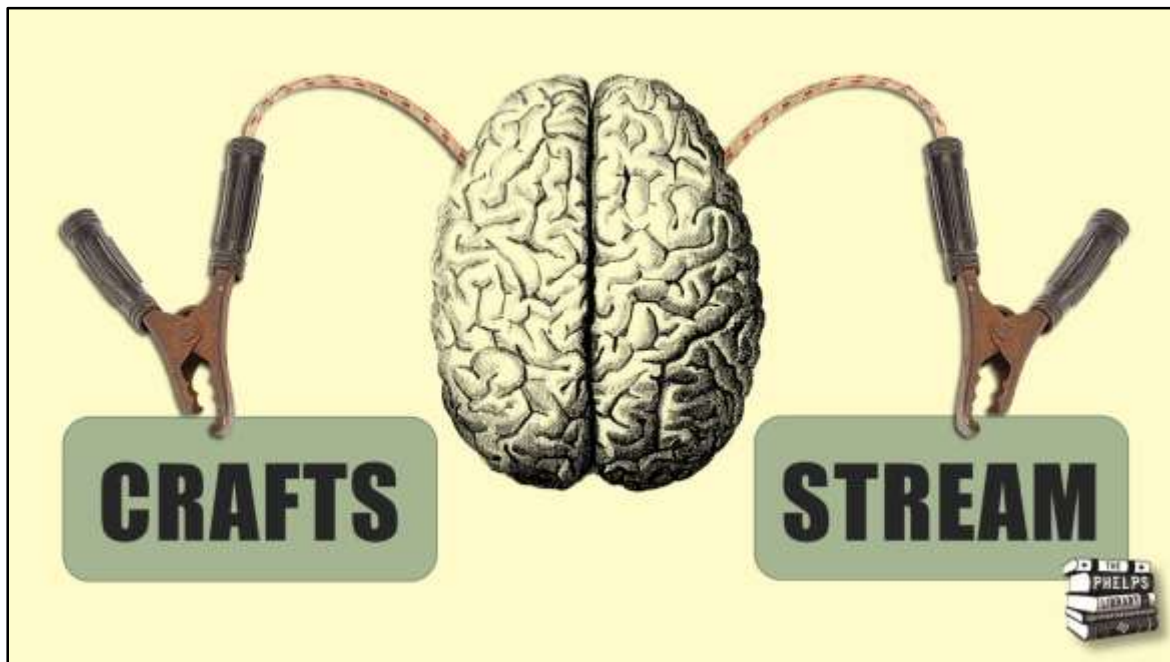
So let's go back to the beginning of the acronym STEM.



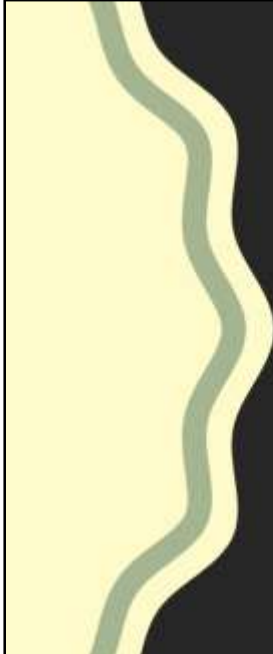
And the 1990s was also one of the first times an acronym was used to define the topic of STEM. The National Science Foundation originally called it SMET. That didn't quite have the same ring to it, so they later changed it to STEM in 2001. Science, Tech, Engineering, and Math are congruent and make sense joining them together.



When you add Art to the mix, suddenly hands-on activities take on a creative bent, with the ability to infuse your innate artistic nature into your project or class. Art allows those who aren't as comfortable with Math and Science to express themselves.



Those in education in particular may opt to choose STREAM, by adding the Reading element. It's a multidisciplinary approach that is cross-curricular, a perfect fit for libraries. No matter which you choose, you will find others who want to be involved.



SCIENCE
TECHNOLOGY
READING
ENGINEERING
ARTS
MATH





The best part? Pick one or two. You don't have to incorporate every aspect of STEAM, you don't have to hit them over the head with the fact that it's a STEM or STEAM program.

Example: Wet felting with wool roving



Knowing the science behind the process teaches students how to solve problems.

Explain: Felting materials and the science behind it.

Ask Questions
& Construct
Explanations

**WHAT
DO
I DO
NOW?**



Science guides you to ask questions & construct explanations



What observations do you have?

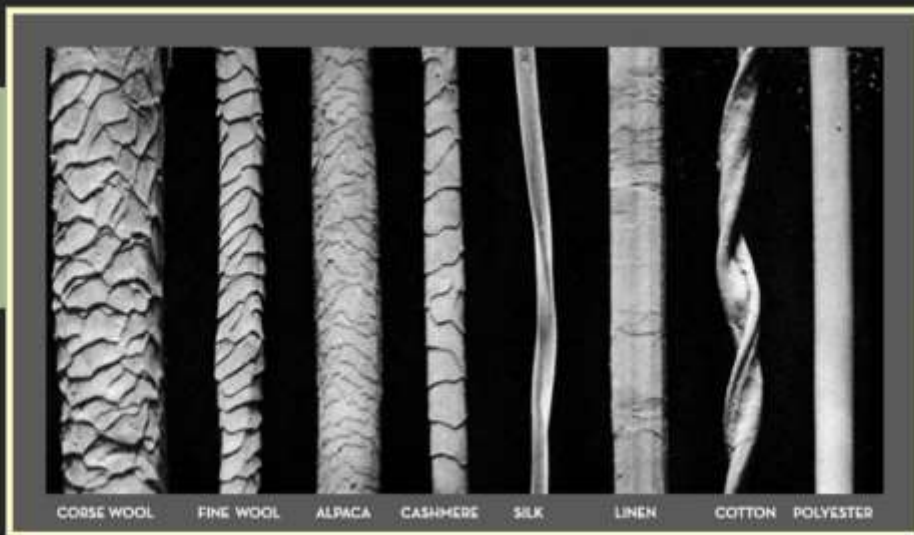
What is the problem?

What can you change/do to help us answer this?

Do you have evidence/data to support this?

Can you communicate to the group what is going on?





COARSE WOOL FINE WOOL ALPACA CASHMERE SILK LINEN COTTON POLYESTER

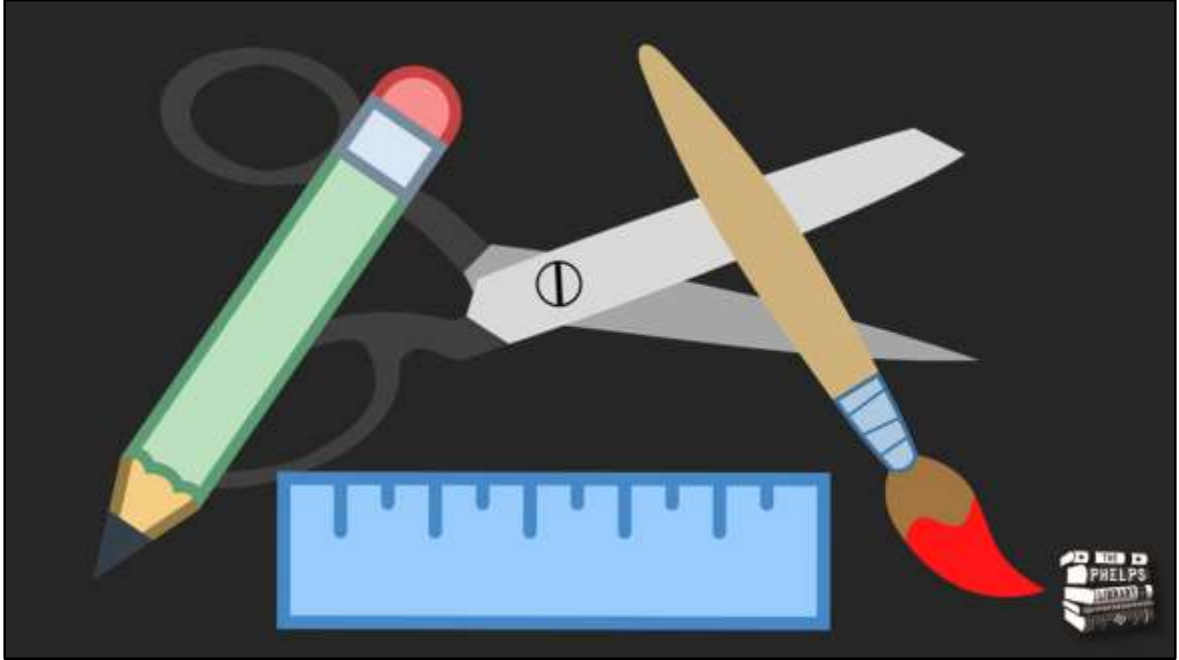


Example: Keratin scales of natural fibers. When heat and soap are added to the wool fibers, it helps the scales open up like umbrellas. Through the process of lubricated friction, the scales mesh and tangle with each other, forming cloth from individual fibers.

TECHNOLOGY

THIS ONE IS THE EASIEST!



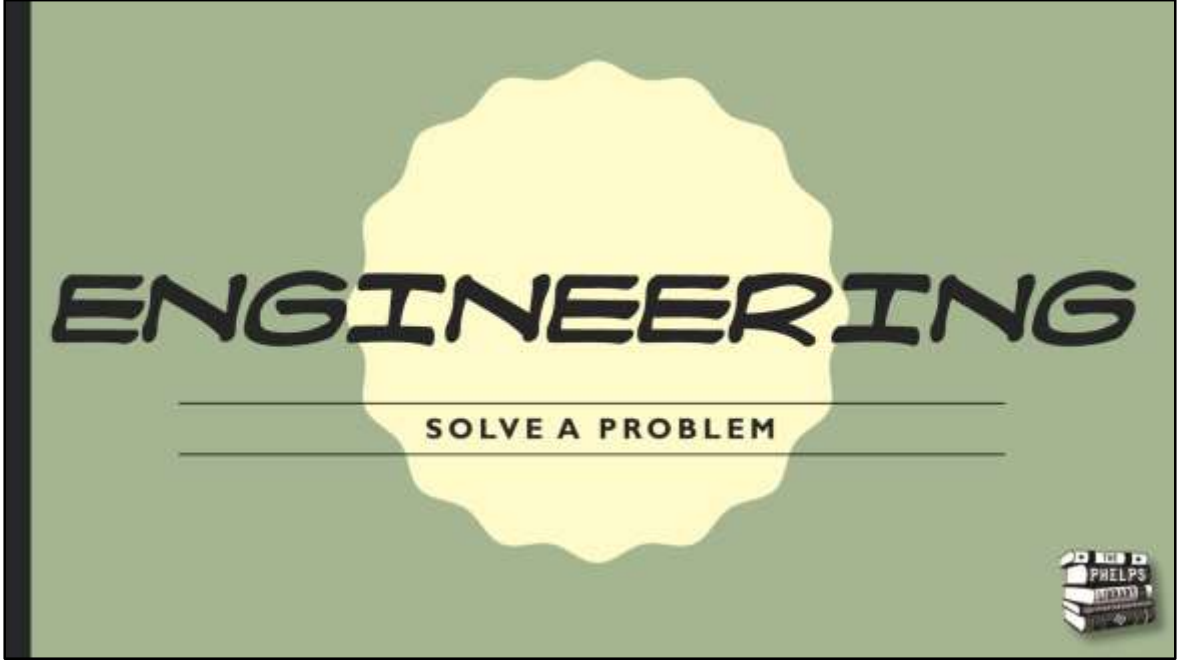


Anything made by man is considered technology. It does not have to be the latest innovative technology or a 3D printer; a pencil, ruler, and scissors are technology.

READING

YOU'VE GOT THIS ONE COVERED!



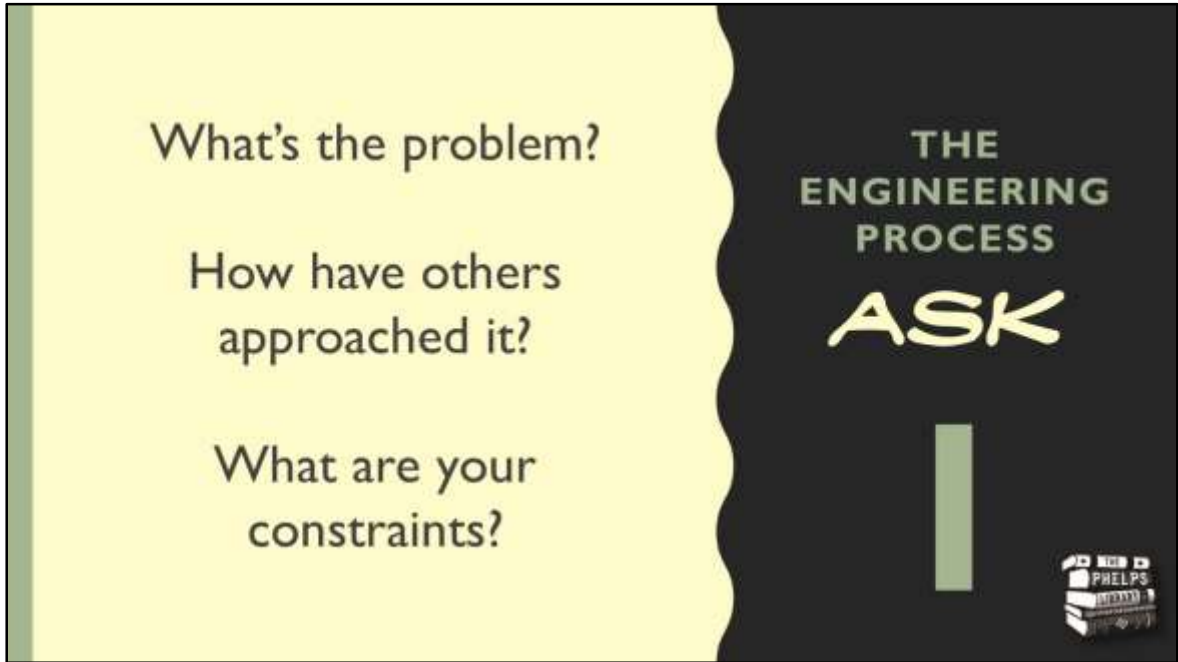


Any time we create something, we are engineers.

Define Problems
& Solutions

**WHAT
DO
I DO
NOW?**





Sometimes the constraints are fear-based. "I can't do that."

It's all about the process.

What are some of your ideas or solutions?

Brainstorm ideas.

What one will work best?

THE
ENGINEERING
PROCESS

IMAGINE

2



Draw it!

Make a list of materials
that you'll need.

THE
ENGINEERING
PROCESS

PLAN

3



Go for it!

Make it!

Try it out!

THE
ENGINEERING
PROCESS

CREATE

4



What works?
What didn't?

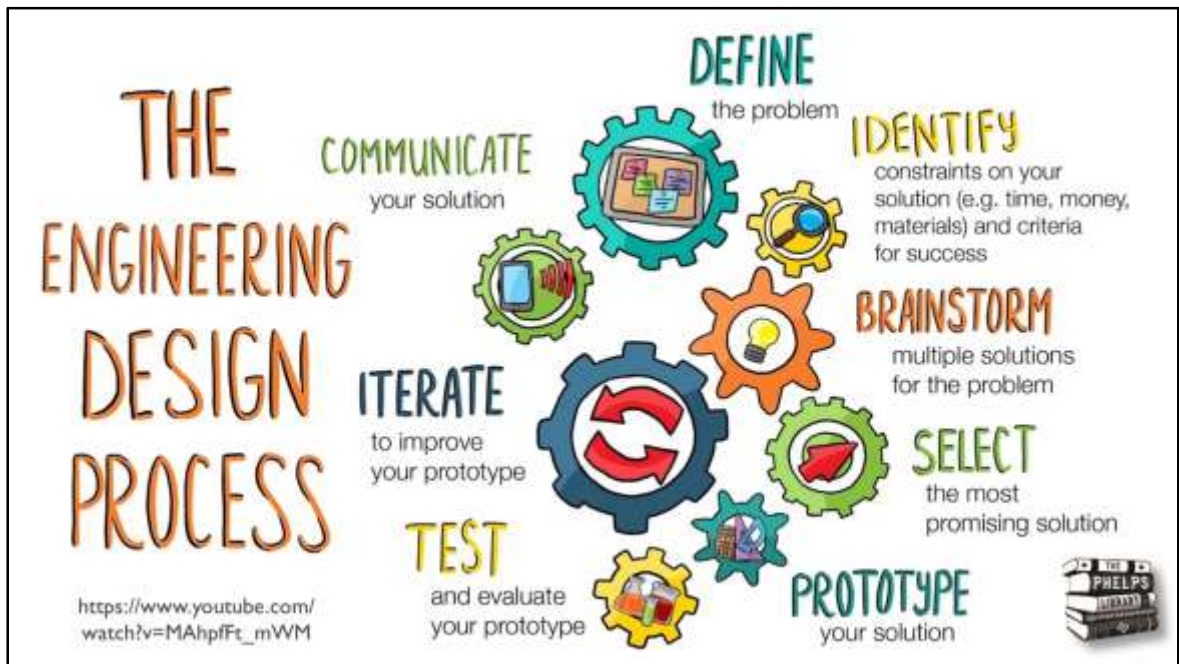
Try it again, and
make it even better!

THE
ENGINEERING
PROCESS

IMPROVE

5





Multiple infographics online if you google Engineering Process. Taco Party: https://www.youtube.com/watch?v=MAhpfFt_mWM

If you think about it, we use the engineering design process every day in our libraries. Applicable to everyday life.



Science asks, Why do we have fish with both male and female parts?

Engineering asks, How do we solve this problem?

Art is what brings the Engineering Solution to life. Yes, people can live in a square box with holes cut out for entry, but art brings Victorian homes with decorative gingerbread, midcentury modern houses, or Farmhouse chic laden with shiplap. Art brings the design element.



Knitting. Knit one row, pearl one row. Additive process.

Change Your
Vocabulary

**WHAT
DO
I DO
NOW?**





Schools have found that by the time students reach middle school, they are unaware of the meaning of these words and cannot apply them to science and engineering practices in school, let alone their daily life.

By incorporating these terms into our library programs, classes, and workshops, we can help students - even starting from preschool - succeed as they progress through school through word recognition

Furthermore, we can teach our library users and students of all ages how to come up with solutions not only with the hands-on projects they are learning but also solutions for real world problems, simply by asking themselves questions

If I increase the amount of wool roving I am using, will it strengthen the cloth?

How can we minimize our spending so that we are more financially independent?

How can improve and optimize my resume so that I can land my dream job?

We are not only teaching craft programs. We are teaching life skills.



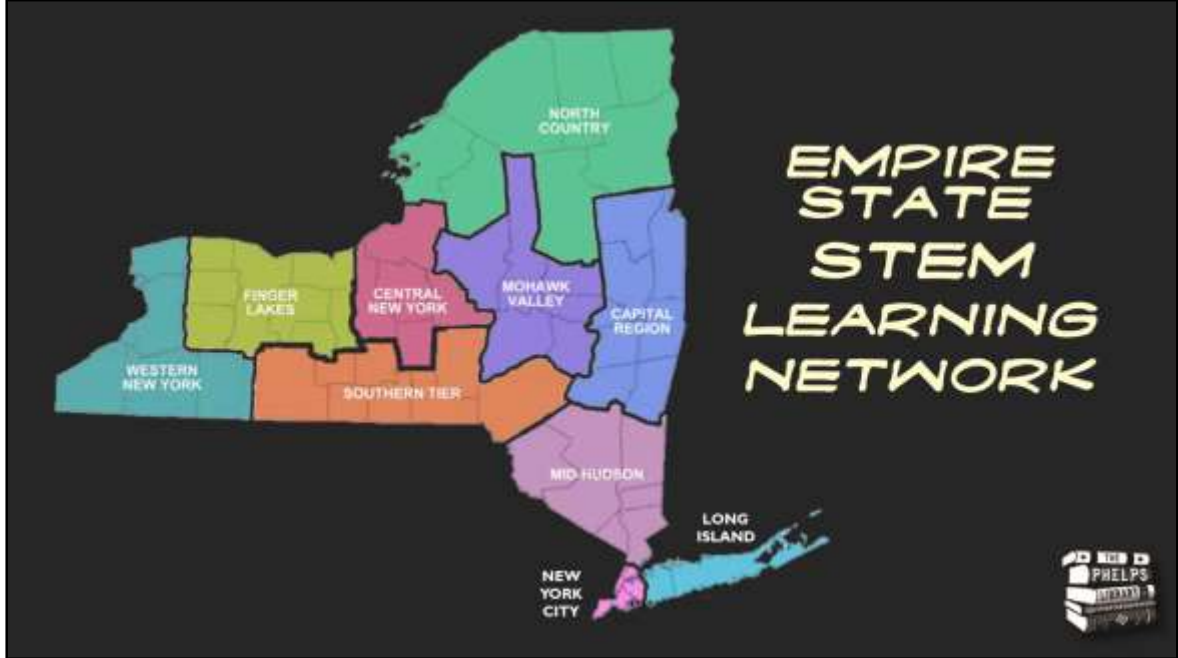
Looking for some assistance with your programs and classes?

Collaborate

Our Pioneer Library System has Maker Kits that they loan out to the libraries

In Phelps, we share our tools and technology with any teachers that want to collaborate.

Find Your Local Experts – almost all classes are taught on a volunteer basis by our local experts



The Empire State STEM Learning Network is a statewide, community-led collaborative. The Network's mission is to advance STEM education to prepare all students for success in school, work and life to fuel innovation and economic vitality in the Empire State. Information on the Network can be found on [their website](#). They also maintain a presence on [Facebook](#).

- Advocate for **policies** that advance interdisciplinary, inquiry-based, contextual teaching and learning
- Contribute to **portfolios** of effective and/or promising STEM practices and programs
- Establish **platforms** for innovative STEM teaching through proven or promising models
- Develop public/private **partnerships** that engage diverse stakeholders over the long term



Finger Lakes Institute at Hobart and William Smith





CITIZEN SCIENTIST

Scientific research
conducted, in
whole or in part,
by an amateur (or
nonprofessional)
scientist



HTTP://TRYENGINEERING.ORG



Lesson Plans Based on Age, from 4 to 18. Listed by 16 Categories, such as the Human Body, Simple Machines, Weather, and so on.



Has over 1500 STEM lessons and activities.

NEW YORK STATE P-12 SCIENCE & ENGINEERING LEARNING STANDARDS

New York State P-12 Science Learning Standards		
P. Physical Sciences		
<p>Standard 1: Scientific Inquiry</p> <p>PS1.1: Ask questions and use observations to test the claim that different kinds of matter exist as either solid or liquid. (Clarification Statement: Emphasis should be on observing and describing attributes and differences between solids and liquids based on their physical properties, mass, and heat-conductivity and categorizing matter based on these properties.)</p> <p>PS1.2: Use tools and materials to design and build a device that causes an object to move faster with a push or a pull.* (Clarification Statement: Emphasis should be on modeling a system of interacting forces, forces on a single object, or forces on multiple objects.)</p> <p>PS1.3: Plan and conduct investigations to provide evidence that sound is produced by vibrating materials. (Clarification Statement: Examples of vibrating materials could include percussion instruments (e.g., bells, maracas), string instruments (e.g., guitar, piano), and membranes (e.g., eardrum). PS1.3.1-PS1.3.2 are not assessed.)</p>		
<p>Standard 2: Matter and Its Properties</p> <p>PS2.A: Structure and Properties of Matter</p> <ul style="list-style-type: none"> PS2.A.1: Describe different kinds of matter and explain how they are different from one another. PS2.A.2: Explain how matter is made of particles. PS2.A.3: Explain how matter can change its state. <p>PS2.B: Forces and Motion</p> <ul style="list-style-type: none"> PS2.B.1: Explain and predict the force of different objects and devices. PS2.B.2: Explain how forces can change the motion of an object. PS2.B.3: Explain how forces can change the motion of an object. <p>PS2.C: Interactions Between Forces and Motion</p> <ul style="list-style-type: none"> PS2.C.1: Explain how forces can change the motion of an object. PS2.C.2: Explain how forces can change the motion of an object. <p>PS2.D: Waves and Properties</p> <ul style="list-style-type: none"> PS2.D.1: Explain how waves transfer energy. PS2.D.2: Explain how waves transfer energy. 	<p>Standard 3: Earth and Space Science</p> <p>ESS1.A: Earth and Space Systems</p> <ul style="list-style-type: none"> ESS1.A.1: Explain how Earth and space systems are related. ESS1.A.2: Explain how Earth and space systems are related. <p>ESS1.B: Earth and Space History</p> <ul style="list-style-type: none"> ESS1.B.1: Explain how Earth and space systems are related. ESS1.B.2: Explain how Earth and space systems are related. 	

Yellow = New
Blue = Practices
Orange = Core Ideas
Green = Concepts



If you want to align your library with the schools, look through the P-12 science and engineering learning standards that were recently updated.

CRAFT → STEAM

Papercrafts

Object Painting

Beginner's Sewing

Gardening

Wreathmaking

Fermented Foods and

Fiber Dyeing

Cheesemaking



They all have technology

Paper crafts such as origami, cardmaking, paper roses (art, math angles, engineering 2D into 3D)

Beginner's sewing – Chameleon Scarf
(<https://learn.adafruit.com/chameleon-scarf/overview>)

Wreathmaking – science (what plants? Why?), engineering, art, math

Fiber dyeing – shibori using indigo dye (oxidation)

Object painting – instead of simply providing with paint, tell them why you are using that kind. Is it because it sticks best to pumpkins? Is it waterproof?



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