STEAM Girls

Educational Guide

by
Girl Museum, Inc.

girl museum

Inside:

STEAM Girls

As we discovered in our ***STEM Girls*** exhibition, girls and women have been working in the sciences for thousands of years, and we have all benefited from their contributions. But being in STEM fields requires something that benefits exponentially from the skills found in the arts, creating ***STEAM Girls***. This education guide provides activities that combine the sciences and arts, offering opportunities to use the dedication, creativity, ingenuity, and curiosity required by both subjects.

This educational guide is designed for classroom use with students in primary/elementary school, secondary school and university settings. Also noted are links to the Next Generation Science Standards (page 3), UK National Curriculum, & US Common Core (pg. 5).

Discussion Questions

Students can answer the following questions on their own or discuss in groups.

1. Having explored the *STEAM Girls* exhibition, consider these questions and perhaps create some of your own.
2. Why do you think painting, writing poetry or playing a musical instrument generally increases a person's success within the sciences?
3. How did people make sense of the world before modern science, and how do you think this was represented in the arts?
4. How can the arts make scientific and technological innovations more accessible to the general public? Can this also be said for scientific projects that include art? Hint: think about images of DNA.
5. Photography is an example of art created through technology and dates back to the nineteenth-century. How do you think modern technology has impacted upon current art forms and where might it go next?
6. If the skills and uses of the arts, sciences, technologies and math are so intertwined, why do we study separate subjects at school and university?

Activities

Activity #1:

Watercolor and Oil Masterpiece

Instructions and image from www.babbledabbledo.com

Next Generation Science Standards:

- 5-PS1-4 - Conduct an investigation to determine whether the mixing of two or more substances results in new substances.
- MS-PS1-2 - Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.

You need:

- Liquid Watercolors
- Watercolor Paper
- Eye Droppers– these are super fun tools for art making!
- Cooking Oil
- Trays or plates
- Paint containers

Instructions

1. Mix your Liquid Watercolors and water in individual containers. Pour cooking oil into one separate container.

2. Place your watercolor paper in a tray, let the oil soak in, then remove it and put your paper on a newspaper covered table. This project is messy!

3. Using an eyedropper, drop watercolors on the paper.

4. Using a different eyedropper, drop oil onto the paper and watercolors.

5. Repeat this three times.

6. Without disturbing the mix too much, move to a safe location to dry.

7. Let dry for several hours or overnight. The art needs to be completely dry, so you might need to wait for two days.

The fun thing about this project is watching how the artwork changes as it dries. The oil punches out the color over time.

The Science Behind the Art:

Oil and water don't mix. No matter how hard you try, these two liquids will avoid each other at all costs! Oil always tends to float top because it is **less dense** than water. Water **particles** (really tiny pieces of material that make up everything in the world) want to be near other water particles, rather than the oil, so they don't mix.

Activity #2: Beatrix Potter

Beatrix Potter is a well-known English novelist, who spent most of her life in the Lake District in Northern England. She is famous for her stories and illustrations of Peter Rabbit and Jemima Puddle-duck. As part of these illustrations, Beatrix drew detailed studies of the natural world within which her characters lived, including fungi, and became respected in the field of mycology (the study of Fungi).
Botanical illustration was one way for Victorian women, in a time dominated by men, to become well-respected scientists and artists.

Looking at this illustration of mushrooms, think about these questions:

- What can you learn about the plant from the pictures?
- What can you see that makes you say that?
- Why has it been drawn from different angles?
- What do you think is the purpose of these drawings?

Activity #3: Become a Botanical Illustrator

Go outdoors and have a go at drawing a plant, a tree or a fungus in as much detail as you can. Keep looking back at what you're drawing to make sure that you aren't guessing. Be careful not to touch things that might be poisonous! Have you learnt something new about this plant or fungus from drawing it much more details?

UK National Curriculum Links:

Art & Design: KS1 & KS2:

- Evaluate & analyse creative works
- Produce creative work
- Become proficient in drawing

Science KS1 & KS2:

- Explore, name and describe materials and their properties.
- Identify and describe different parts of plants.
- Study and observe your local environment.

English KS1 & KS2:

- Plan, write and assess using other similar writing as models.
- Develop ideas through research

US Common Core Links:

Science

- K-LS1-1: Use observations to describe patterns of what plants and animals need to survive.
- 4-LS1-1: Conduct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

ELA Common Core Standards

- CCSS.ELA-Literacy.W9-10.3: Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.

Activity #4: Modern Science as Inspiration for Writing

Mary Shelley is one of the most famous English female writers of the Victorian period. The daughter of a political philosopher and a feminist thinker, Mary is best know for her Gothic novel *Frankenstein*.

Mary was inspired by both current medical procedures which increasingly involved testing and pushing the boundaries of life and death, and notions of Enlightenment through which the common good could be provided for by political power.

Frankenstein's monster was both a product of scientific research at the time and a reminder that power to make decisions for others doesn't always lead to a positive outcome.

Using one of the following medical advances of today, plan and write a story that explores the possibilities that this research may hold for society:

- Bionic retinas for blind people.
- DNA mapping to find out what diseases you will get.
- 3D printed part-organic, part-electronic body parts.

Discuss your story with classmates. What do you think are the implications for modern society? How will such technology shape who we are? And should we embrace this technology, or be wary of its power?

Bonus points:

Share your activities with us to be featured on Girl Museum's blog!

Email an essay, photos, and/or a video of your project to share@girlmuseum.org

Girl Museum

We are the first and only online museum about girlhood.

We exhibit, educate, and raise awareness about the unique experience of being born and growing up female around the world in the past and present.

As a community of passionate and creative individuals, we acknowledge and advocate for girls as forces for collective responsibility and change in the global context, not as victims and consumers.

We are a 501(c)3 non-profit educational organization.

Learn more and get involved at www.*GirlMuseum.org*

Activity #5: Windmill Design

The world increasingly needs **renewable energy**. This type of energy can power our homes but not burn coal and oil (fossil fuels), which pollute our world.

Renewable energy sources help us decrease pollution while providing us sources for energy that can continue long into the future.

One example is windmills. Scientists *and* designers were involved in the design of the windmills that you see on nearby hills.

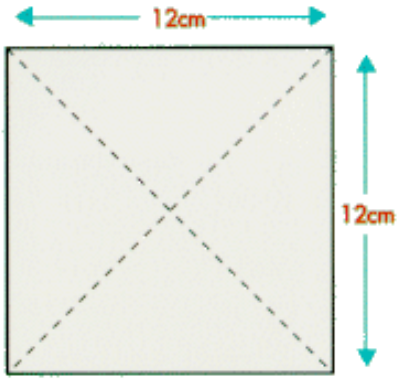
Using the diagram below, try using different materials (such as paper, cardstock and tin foil) to produce the windmill blades.

Blow the blades with a hairdryer and record which material creates the smoothest, strongest and most durable design.

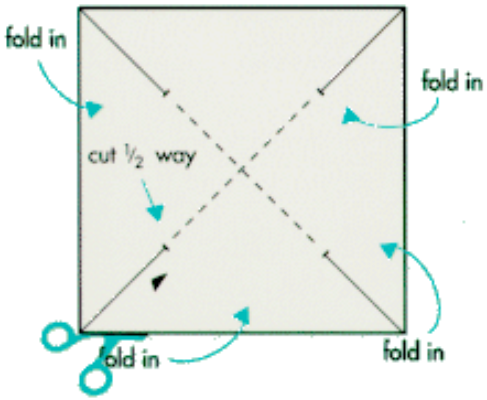
See instructions on the next page.

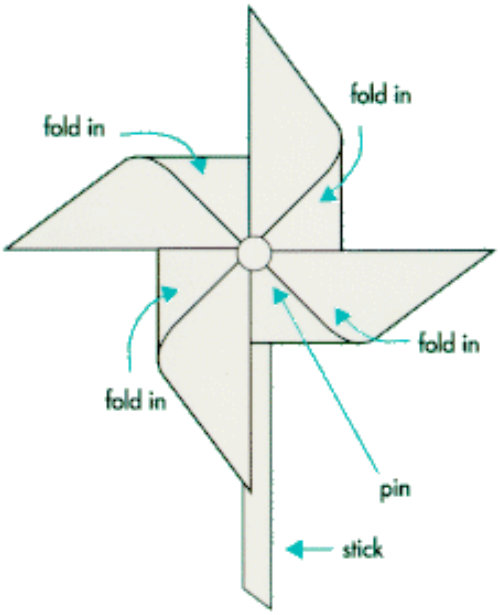
Windmill Instructions

① Take a square piece of thin card 12cms x 12cms. Draw two lines from one corner to the other.

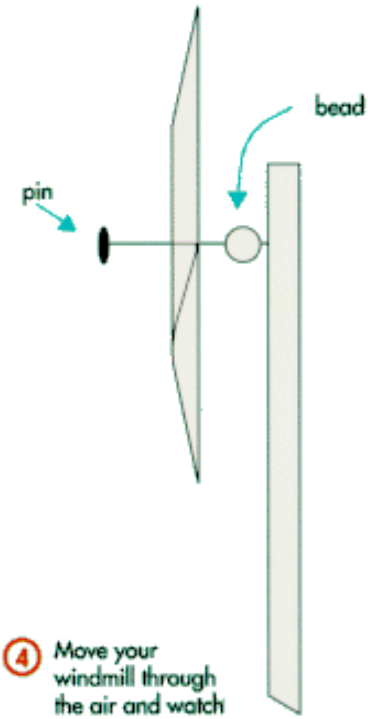


② Now cut halfway along each line.





③ Fold in each corner and push a pin through the centre and fix a bead between the windmill and the stick.



④ Move your windmill through the air and watch what happens.

Make another windmill but this time cut one quarter of the way along each line instead of half.

Does this make any difference in the way your windmill turns?

Thanks to the Helicopter Association International for this diagram.