Suminagashi Paper

STEM CONNECTIONS

Science: Structure and Properties of Matter

Technology: Creative Communication

DURATION

60 Minute Lesson

MATERIALS

Foil pan (1 per group)

Toothpicks (6 per group)

Watercolor paper (2 sheets per student)

Suminagashi Marbling Ink (six color set)

Paint palettes (2 per group)

Paper towels

SCHEDULE

- Introduction (10 min)
- Japanese Suminagashi Paper (40 min)
- Clean Up & Wrap Up (10 min)

OBJECTIVE

Discover the history and origins of suminagashi mono-prints and the suspenseful science of surface tension.

ALIGNED STANDARDS

ISTE-S.6.b Students create original works or responsibly repurpose or remix digital resources into new creations.

NGSS 5-PS1-3 Make observations and measurements to identify substances based on their properties.

HABITS OF MIND

- Creating, Imagining and Innovating
- Managing Impulsivity

21ST CENTURY SKILLS

- Creativity and Innovation
- Flexibility and Adaptability
- Social and Cross-Cultural Skills

BACKGROUND INFORMATION

Often used as a background for calligraphy or as decorative book covers, Japanese Suminagashi paper is plain white rice paper that has been infused with a marbling of water and ink. It's a delicate process, but one that creates vibrant designs that have been a traditional part of Japanese culture since before the 12th century. Originally, the marbled paper was reserved for only the Japanese upper class who'd use the paper for short poems, haikus or as the base for other forms of art.

Now, in order to better understand this method of art, its name needs to be examined. The word "Suminagashi" translates to "floating ink," which describes exactly what the artist is doing when they create Suminagashi paper — they're painting on water with ink! Traditionally, the process starts with a small tray of water. Once the surface was still, the artist carefully drops special colored inks into the tray. Due to the water's surface tension, the inks actually float above the water. This allows the artist to "paint" with the ink by drawing with special tools or by gently blowing across the surface. As the ink moves across the water, the artist is able to control its path, forming delicate shapes and patterns. Once the design was complete, the artist lays a sheet of white rice paper across the water, allowing the blank page to soak up the vibrant colors.

While the designs of finished suminagashi paper vary greatly, there is one rule that will always remain the same. From the moment you fill your tray with water, you have to be cool, calm and careful — one wrong move can disrupt the water's surface tension, destroy the design and force you to start from scratch!

Today, the way Suminagashi paper is created remains very similar to the original method perfected by 12th century Shinto priests. Although, with the help of science, modern day artists have been using acrylic paints and fluid mechanics to produce even more complicated designs. By controlling the colors through the density of the pigments and the surface tension of the water, artists can create beautiful landscapes — that sometimes even contain animals — before preserving the image on a sheet of rice paper.

DAILY PREP

- Gather today's materials and read through the Background Information and lesson.
- If possible, create an example sheet of marbled paper to share with the group.
- Set up a suminagashi station for each group with one foil tray filled with 1-2" water. Right before starting the lesson, fill a paint palette with marbling ink for each group.

STEP-BY-STEP DIRECTIONS FOR INSTRUCTORS

Whole Group

INTRODUCTION

Welcome campers back to *Traveling Artist Camp*! Introduce suminagashi paper marbling either by reading directly from the Background Information or ad-libbing in your own words. Then, break the surface tension by leading a short discussion:

- What kinds of surfaces do artists usually paint on? Is it possible to paint on other surfaces?
- What surfaces or materials seem impossible to paint on?
- Could it be possible to paint on water?

Small Groups

JAPANESE SUMINAGASHI

Before students break out into their stations, first demonstrate the process to the class.

- To "paint" the water, transfer the marbling ink from the paint palette to the tray with a toothpick.
- Designate one toothpick for each color of ink. Wherever the toothpick is dipped in the water, the color will spread out.
- To spread the colors out even more, dip the tip of another toothpick in the center of the first dot.
- As you create a series of rings that cover at least half the pan, take this opportunity to give more background information on suminagashi paper or artistic creativity.
- Once you've covered the pan, work to make designs with the ink by gently blowing across the water or by using a toothpick to carefully swirl the paint into patterns.
- As it sits on top of the water, the ink will appear much lighter than it actually is — this is okay! The second part of the magic is seeing it brighten up as it transfers to the paper. When at least half the pan is covered in ink, gently lay a piece of rice paper across the water's surface. Then, as soon as it's completely soaked through, lift the paper straight up into the air — be careful not to drag it across the surface of the water. Have paper towels nearby where you can lay your suminagashi paper down to dry.

Tip: The wet paper becomes very delicate and may fold over onto itself. Do not try to fix it just yet. Instead, just lay it down to air dry. Once it is completely dry, unfold the paper and flatten it out.

Group Discussion

CLEAN UP & WRAP UP

Collect leftover rice paper and toothpicks and lead a short wrap up discussion on the science of surface tension. Possible questions:

- How was the ink able to float on top of the water?
    - Is it less dense? (Try squeezing the bottle of ink high above a tray of water. It should sink beneath the surface, showing that the ink is actually more dense than the water.)
    - Why is it able to float when it's added gently? (Water is made of tiny molecules of H2O, which like to stick together. Because they're so cohesive, a thin, invisible membrane forms along the surface, like a mini stretched out layer of cellophane. With a lot of force, objects can break through the membrane. But, when added gently, the surface tension is strong enough to keep the object from breaking through, even if it's more dense than the water. This is why paperclips can be carefully rested on top of water, water striders can run across streams and ponds and ink made with heavy pigments can float on top of water.)
- Why does the ink form a circle? (Because it can't pass through the surface of the water, the ink spreads out on top, forming a mono-layer just one molecule thick. The ink has its own surface tension because of the bonds between its molecules, so it forms a circle on top of the water.)

CHECK FOR UNDERSTANDING

- When and where did the suminagashi paper tradition start? (*The tradition started in the 12th century with Japanese Shinto priests.*)
- How was the ink able to float on top of the water? (*By resting on top of the water's surface tension, the more dense ink is able to float.*)
- Why did the ink form in the shape of circles? (*The ink has its own surface tension because of the bonds between its molecules, so, as it spreads across the surface of the water, it forms a circle.*)

EXTENSIONS

Art Extension

If your campers made Traveling Artist journals, give them a decorative cover with suminagashi paper.

English Language Arts Extension

Write journal entries to record the day's travels! Where did you travel? What kind of art did you find? What does this type of art mean to the people in that part of the world and what does your creation mean to you? Encourage campers to make it both a written and visual journal by including drawings along with their reflections! Check out the Journal Entry sentence starters in the Appendix if you think they might be useful for your campers.

STEM Extension

Water molecules are sticky! Not only do they stick to each other (a phenomenon known as cohesion), they can also stick to other surfaces (a similar process called adhesion). Paper is hydrophilic (aka "water-loving), so the water has no trouble sticking to its surface. As the water bonds with paper, it pulls more water along with it (remember, water's sticky) and within seconds, the ink has completely transferred to the paper. That's why paper towels are so good at cleaning up spills and why plants are able to fight gravity as they send water from their deepest roots to their highest branches. With this information, make a hypothesis about the adhesive properties of other kinds of paper. Which paper is the most hydrophilic? The least? Then, conduct an experiment to test it out. If you made Traveling Artist Journals, record the results of the experiment.