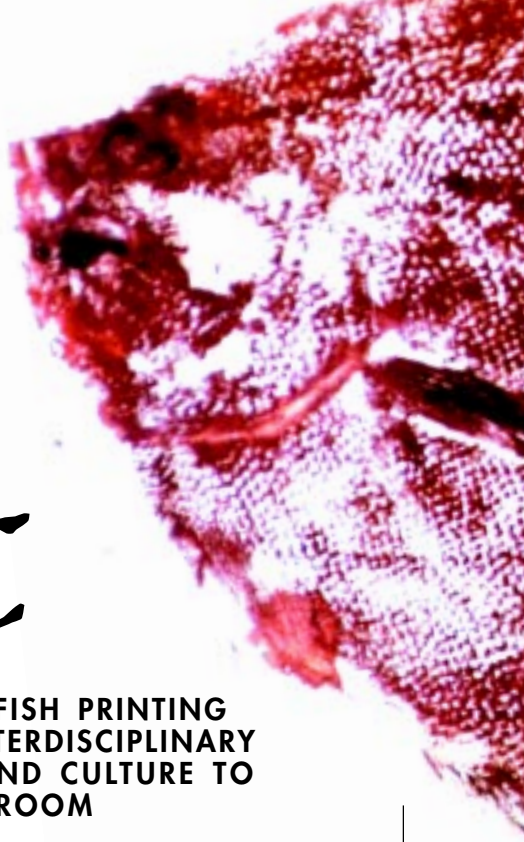
the fin art of science



JAPANESE FISH PRINTING BRINGS INTERDISCIPLINARY SCIENCE AND CULTURE TO THE CLASSROOM

GYOTAKU—THE JAPANESE ART OF fish printing—evolved in Japan more than one hundred years ago as a means for fishermen to record and document the size of their catches. In the days before cameras, making fish prints provided proof of the catch by preserving the size and appearance of a fish.

In traditional fish printing, fish were painted with ink and then rice paper was laid carefully over the fish surface and smoothed down. When the rice paper was lifted off, a life-size impression of the fish was revealed. Today, many artists in various countries practice gyotaku, some selling prints for thousands of dollars.

Fish printing provides an excellent classroom activity to introduce the topic of fish anatomy, as well as an opportunity for teachers to talk about Japanese culture and different printing and painting techniques. The technique reinforces science as a human endeavor, illustrating that anyone can do science; gyotaku was developed by fishermen, not by stereotypic, white-coated scientists in the laboratory. Students see that individuals from many different cultures can practice science as a means of finding solutions to their problems.

Gyotaku provides an excellent way for students to enhance their scientific process skills (observing, hypothesizing, experimenting, comparing, contrasting, and measuring, to name just a few) and to practice scientific inquiry effectively. When encouraged to experiment with different types and amounts of paint and different materials on which to print (paper, cloth, tissue, and so forth), students are able to use the scientific method to find the best combination of materials to produce the perfect fish print. In addition, the activity accommodates a number of different learning styles, being especially effective for students who are kinesthetic, tactile, or visual learners.

Gyotaku is interdisciplinary and can easily be adapted for use with almost any grade level. I have used this activity many times in elementary, middle, and high school classes, as well as in preservice teacher classes focusing on science methods. It never fails to delight and fascinate preservice teachers, many of whom have used the activity in their own classrooms. One teacher even wrote: "This was a wonderful science project. As a teacher, I could see myself introducing this activity as an extension to a lesson on Japan. I can definitely foresee the advantages of using gyotaku as a science and art lesson. It promotes a strong awareness of other cultures as well as helps children understand the relationship between people and nature. It also introduces them to a magnificent art form.

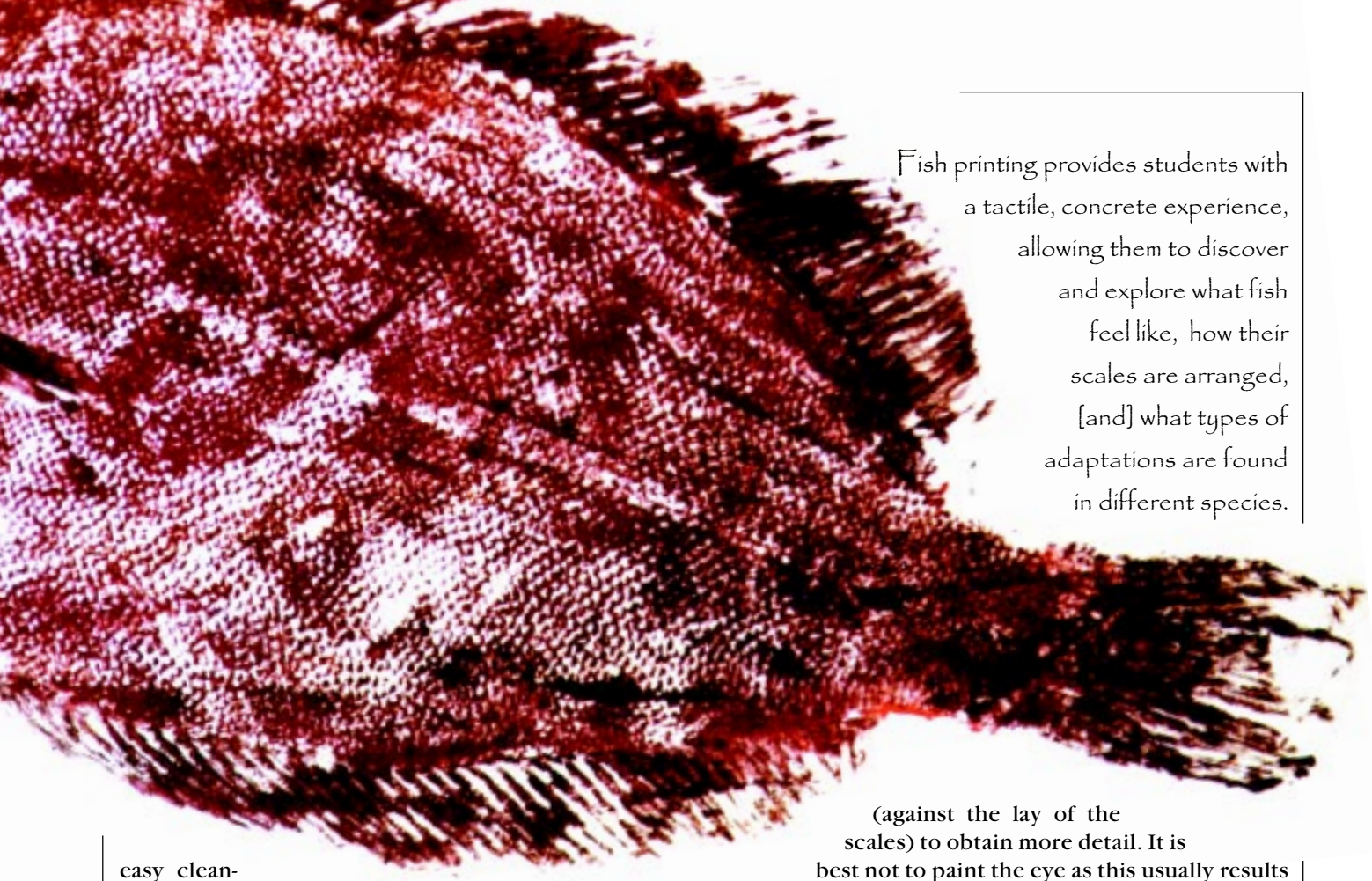
Children should be introduced to all the wonders of our planet. By sharing other's cultures, traditions, and philosophies, children will form an understanding of and respect for our diverse world. Science and art: What a great combination!"

NINA CHRISTIANE STOKES

MAKING THE PRINT

All the materials required to make fish prints are easily accessible. They include paint (acrylic, fabric, and ink), foam brushes, paint brushes, paint rollers, newspaper, handkerchiefs, paper towels, tissue paper, construction paper, rice paper, sand, Styrofoam, large plastic sealable bags, T-shirts, and paper plates (for mixing paint). Depending on the geographical area, fish can be caught or purchased. I usually use water-based acrylic paints for

FISH PRINTS COURTESY OF THE AUTHOR



Fish printing provides students with a tactile, concrete experience, allowing them to discover and explore what fish feel like, how their scales are arranged, [and] what types of adaptations are found in different species.

easy clean-up, but depending on whether the material being used for printing is paper or fabric, permanent or fabric paints can also be used.

To perform the activity, students should:

- Cover the work area with newspapers.
- Use water to wash the mucus off the fish. (Be sure to discuss mucus' friction-reducing function with students.)
- Pat the fish completely dry and lay it flat on the newspaper.
- Apply the paint with a variety of painting implements. Experiment with rollers, foam brushes, paint brushes, or even fingers—anything that gives good coverage.
- Smooth the paper or fabric firmly over the surface of the fish to transfer the paint from the fish to the paper. Once the whole area has been smoothed over, carefully lift off the paper and hang or lay it flat to dry.
- Wash the paint off the fish and dry it to prepare for the next print. One fish can be used to make several prints.

To obtain good prints, students can fan out the fins and then pin them in place or support them from beneath with pieces of clay or wet paper towels. A support area for the fish can be created by cutting out an outline of the fish shape from a square of Styrofoam or by making a well for the fish in a sand-filled plastic, sealable bag so that half the fish is submerged in the sand. This helps to stabilize the fish and provides a flat surface for printing. We usually brush paint from tail to head (against the lay of the scales) to obtain more detail. It is best not to paint the eye as this usually results in a large smudge. I advise painting the eye in by hand after the print has dried.

I have not come across any safety problems, although I always ask students before the activity if they have an allergy to fish or seafood. Students should wash their hands thoroughly after handling the fish. Odor should not be a problem if the fish are fresh and kept on ice until the activity. I usually use two heavy-duty garbage bags to dispose of the fish after the activity, making sure they are securely closed.

Fish printing provides students with a tactile, concrete experience, allowing them to discover and explore what fish feel like, how their scales are arranged, what types of adaptations are found in different species, and so forth. By using a number of different fish species, students can compare and contrast external characteristics and suggest possible reasons for differences.

This activity provides opportunities to discuss and practice the scientific method and processes involved in science. A great problem-solving assignment is a discussion or written response to the question, "If you were going to print on a different medium such as fabric, how might you change your technique and why?" Ideally, students would form a hypothesis and experiment further with different media either in class or at home to test and, if necessary, revise their hypothesis. Students can investigate the efficacy of using different paints, printing mediums, and fish species to discover which combination results in the best fish print.

USEFUL REFERENCES

Cook, A. 1993. *Nature Crafts for All the Seasons.* New York: Sterling Publishing Company.

Klemm, E.B., F.M. Pottenger III, T.W. Speitel, S.A. Reed, and A.E. Coopersmith. 1995. *The Living Ocean: Biology and Technology of the Marine Environment.* Honolulu, Hawaii: Curriculum Research and Development Group, University of Hawaii.

Olander, D. 1994. *Gyotaku Fish Impressions: The Art of Japanese Fish Printing.* Portland, Ore.: Frank Amato Publications.

Gyotaku Prints from Hawaii. *www.gyotaku-prints.com/gallery.html.* (An art gallery website that illustrates the possibilities.)

ASSESSMENT ANGLES

One of my favorite assessment methods is reading students' responses to the essay question, "What did I learn?" By asking such a broad question, students can freely express themselves and not feel limited, as they would by more specific, short-answer questions. It also provides an opportunity for students to practice their writing skills.

A discussion of the relative advantages and disadvantages of gyotaku as a recordkeeping method, as compared to other methods such as photography, sketching, and basic descriptions using words and numbers, provides an opportunity for students to develop their critical thinking skills.

Another novel way to assess learning in this situation would be for students to make class presentations using their fish print (or the real fish if this is feasible!) as a visual, pointing out features of its anatomy and any special physical adaptations it might have for its particular habitat. The student presentation could then be followed by a class question and answer session.

One assessment technique I have found particularly effective and exciting for the students is to make a photocopy of each fish species print and provide groups of students with one copy of each, asking them to identify anatomical features of different species. This works best when students have been printing physically different fish species such as mullet and flounder. Mullet have prominent, thick scales that stand out well and make particularly effective prints. Flounder are also excellent fish to include in this activity because they have such interesting and extreme physical adaptations to their bottom-feeding lifestyle. Students are always amazed that both of their eyes are on the same side of their body.

ACTIVITY EXTENSIONS

There is no reason to stop at making prints from fish—many invertebrates such as shrimp, crab, starfish, squid, and octopus also make great prints. The shells of mollusks work very well, as do seaweed and leaves.

Magnifying glasses and microscopes should be available for students to use. It is possible to view the growth rings on some of the fish scales, which can lead to further discussions about lifestyle and how certain environmental stresses can cause variations in the pattern of rings. Looking at different types of scales (ganoid, ctenoid, placoid, and cycloid) under magnification can also be interesting to students.

If obtaining fresh fish proves difficult, there are companies that sell very realistic plastic fish models from which excellent prints can be made; however, I believe that the sensory experience provided by the real fish is invaluable, and I recommend using the real thing whenever possible.

The *National Science Education Standards* (National Research Council, 1996) emphasizes the importance of making science investigations meaningful. This activity provides teachers with a valuable opportunity to immerse students in the scientific process and helps them realize that there is much more to science than memorizing lists of scientific and technologic vocabulary. Interdisciplinary in nature and relevant to everyday life, fish printing teaches students that science is for everyone and everyone can do science. ✧

Nina Christiane Stokes is an education specialist for the City of Tampa Water Department, 529 South Parson's Avenue No. 203, Brandon, FL 33511; e-mail: ninadv3399@aol.com.

REFERENCE

National Research Council. 1996. *National Science Education Standards.* Washington, D.C.: National Academy Press.