When a science teacher, an art teacher, and a botany professor team up to talk about—plants, of course—things really get growing! As part of a longstanding partnership with the biology department at the University of Wisconsin–La Crosse, our school has been involved in numerous successful plant projects over the years. But, by far, the most exciting and creative project we’ve collaborated on was our recent integrated science/art study, “Plants, Pots, and Paints.” This interdisciplinary project was successful in connecting content across disciplines (science to art) and for motivating fourth- and fifth-grade students to create something beautiful both they and our entire community can enjoy.

Planting Bulbs
It all began with an August meeting where we brainstormed core science and art concepts. In science, we emphasized the idea that plants have structures that serve different functions in growth, survival, and reproduction. In art, we focused on understanding and applying media techniques and processes, and using knowledge of structures and functions. We then identified different hands-on experiences students could participate in based on these core concepts, such as growing, drawing, painting, and dissecting plants. We also created a timeline to coordinate our overlapping project activities (Figure 1, next page).

Our focus was on upper elementary students because they would have the requisite skills for creating the artwork. Our fourth-grade science curriculum includes detailed instruction in flower and plant parts. What the students learn in fourth grade would be applied in work with visiting artists in fifth grade.

We chose bulbs for this project because they are perennial, they bloom during the school year, and they can be “forced” to bloom in containers with proper cold treatment (see Lawniczak, Gerber, and Beck 2004 for more information).

By Pat Stellflue, Marie Allen, and D. Timothy Gerber
on cold-treated bulbs).

Following instructions supplied with the bulbs, during October and November fourth-grade students planted an outdoor garden (an area of the schoolyard tilled by the district’s building and grounds department) with crocus, iris, and daffodil bulbs purchased from a local garden center. We funded the first year of the project through two grants and a bulb sale.

The outdoor gardens would be an “outdoor art” installation and also supply cut flowers in the spring for the science and art classrooms. The outdoor gardens were also the site of a science experiment.

To provide plants prior to spring blooming, we planned to “force” daffodil and tulip bulbs for indoor blooms. In December, we placed bulbs in egg cartons and covered them with damp (not wet) newspaper strips. Students took the cartons home and refrigerated the bulbs for a 12-week cold treatment.

Utilitarian Art
The art portion of the project focused on clay pot construction and plant illustration techniques. In addition to being artwork themselves, the pots would also conveniently serve as containers for the forced bulbs.

While the refrigerated bulbs were being “cold treated,” students made clay coil pots using clay rolled into long tubes that were then coiled to make the body of the pot. After the pots were constructed, they were fired, glazed, and fired again in the art room’s kiln. Another option, for teachers without access to a kiln, would be to purchase terracotta pots, paint them with acrylic paints, and seal them with lacquer or polyurethane. Make sure all safety precautions are followed when working with glazes, paints, or any other chemical.

When the cold-treated bulbs were returned to school and removed from the egg cartons, students planted one or more bulbs (depending on pot size) in their clay pots, covered them with potting soil, and watered them. Each pot had drainage holes, so students also made matching trays to catch the water. The planted pots were placed in the science classroom.

Scientific Subjects
In March, prior to spring bloom, we used purchased cut flowers to practice plant-illustration techniques with a variety of media (e.g., pencil, ink, scratchboard, watercolor) in art class (see Resources). Students drew a large, single-stem flower and outlined it in pen and ink or brush and ink. Students then added color and identified flower parts. The idea was for the illustrative drawings to be informative, not just decorative.

In the spring, flowers from both the containers and the schoolyard were used as subjects for drawing and painting using various illustration techniques.

Fourth-grade students also spent time creating a value scale showing the lightness and darkness of a color and working with color classification using a Munsell® color chart made with standardized color chips. Fifth-grade art students spent part of one day outdoors working on canvas boards with a local Plein Air art group. Plein-Air Painters of America is an organization devoted to outdoor, open-air, “painting from life.”

Students critiqued completed works of art individually and in groups. Students’ understanding of technique was also assessed.

All Hands on Plants
The science portion of the project focused on using crocuses, daffodils, and tulips as model organisms to teach life science concepts in an extensive unit on the structure and function of plants’ leaves, stems, and roots.

Students used Geoscopes® (30X Portable Indoor/Outdoor Lighted Microscope, see Resources) to examine the growing plants and their structures in the garden. Because other grades had planted gardens next to the school as well, students were able to examine several types of plants and various vein patterns in the leaves.

After planted pots of bulbs were transferred from the art classroom, students observed their growth in the classroom. Students were able to observe different stages of plant development.

After reaching maturity, blooming plants were used for illustrations. Drawings were labeled to include

<table>
<thead>
<tr>
<th>Month</th>
<th>Activity</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oct – Nov</td>
<td>Bulb planting in schoolyard and science experiment setup</td>
<td>Fourth</td>
</tr>
<tr>
<td>Dec</td>
<td>Clay pot construction in art class</td>
<td>Fourth</td>
</tr>
<tr>
<td>Dec – Feb</td>
<td>Bulb cold treatment</td>
<td>Fourth</td>
</tr>
<tr>
<td>Feb</td>
<td>Planting cold treated bulbs in pots</td>
<td>Fourth</td>
</tr>
<tr>
<td>Mar – Apr</td>
<td>Plant growing, observing, and dissecting in science class</td>
<td>Fourth</td>
</tr>
<tr>
<td>Apr – May</td>
<td>Drawing, painting, and other media in art class</td>
<td>Fourth and Fifth</td>
</tr>
<tr>
<td>May</td>
<td>Plein Air artists visit</td>
<td>Fifth</td>
</tr>
</tbody>
</table>
grade-appropriate science vocabulary (e.g., stem, leaves, roots, stamens, pistil, petals).

After the tulips bloomed, they were removed from their containers and dissected. Observations of the entire plant were necessary to understand the function of all plant parts. Finally, a discussion of plant form and function was conducted with a local university botanist to address misconceptions about plants.

Each student’s level of understanding of plant biology was formally assessed. Fourth-grade science tests include questions on plant structure and function. Students’ illustrative drawings were also assessed for accuracy.

**Bulb Growth Experiment**

Some of the outdoor bulbs planted in the schoolyard in the fall were used in a science inquiry. A dozen tulip bulbs were planted at each of three different depths: at the surface, at a normal planting depth of 15 cm, and at 30 cm deep. The goal of the experiment was to determine optimal planting depth. Because instructions that came with the bulbs suggested planting at 15 cm, this depth was used as the control in the experiment.

Students were to measure survival and height of the plants grown at different depths and compare growth of the bulbs planted at the surface and at 30 cm depth against survival and growth of the control plants. Unfortunately, the bulbs were planted too far away from the school, and the local deer population ate all of the tulips! This led to a fruitful discussion about other environmental factors that could kill or damage plants.

After spring bloom, the students discovered that deer don’t eat daffodils. Next year’s fourth-grade class will repeat the experiment with daffodils.

**Integration Grows**

Students were very motivated by their plant/art studies—and learning was enhanced in both subjects because of the integration. For example, in art class, students developed observations skills as they learned new plant-illustration techniques. Having learned more about plants’ form and function in science class, students applied that knowledge to their drawings. Also, after dissecting plants in science class, their drawings were more informed and detailed.

On the flip side, in science class, students took better care of their plants because they had made the pots and drainage trays in which the bulbs were planted. They were also able to use drawing and painting techniques learned in art. Overall, the best outcome of the project was seeing how the separate disciplines of art and science could be brought together effectively to create a bigger, better whole. Now, with the success of our school’s plant projects, we’ve begun to pass the information along to other elementary teachers in our district. We want to encourage them—and you—to conduct similar studies at other schools. Integrating art and science will likely grow on you, too.

**Acknowledgements**

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**Resources**


**Internet**

ASPB (American Society of Plant Biologists). *Principles of Plant Biology*  
[www.aspb.org/education/foundation/principles.cfm](http://www.aspb.org/education/foundation/principles.cfm)

Plein-Air Painters of America  
[www.p-a-p-a.com](http://www.p-a-p-a.com)

**Connecting to the Standards**

This article addresses the following *National Science Education Standards* (NRC 1996):

**Content Standards**

**Standard C: Life Science**

**Grades K–4**

- The characteristics of organisms
- Life cycles of organisms
- Organisms and their environments

**Grades 5–8**

- Structure and function in living systems
- Diversity and adaptations of organisms