

CONTENTS

You Are a STEAM Teacher

NANCY WALKUP

PART 1: SCIENCE

- | | | | |
|----|---|----|---|
| 2 | A Fish Story
A Loving Legacy for a Retired Teacher
CRAIG HINSHAW | 16 | Magnificent Marbling
Playing with the Concept of Surface Tension
DONNA CARIOLA |
| 6 | The Cycles of Metamorphosis
Integrating Art and Science
NANCY WALKUP | 20 | Cycles of Life
Frog Metamorphosis in Clay
NAOMI SWYERS |
| 8 | Plastic Landscapes
Integrating Art and Recycling
EUNJUNG CHANG AND AMBER HARRAR | 24 | The Artist as Naturalist
Correlating Art and Natural Science
RACHEL WINTEMBERG |
| 12 | Beads & Seeds
A Collaboration Between an Art Museum
and a Botanical Garden
PATRICIA SIGALA AND MOLLIE PARSONS | 30 | Wondrous Watercolor
Cell Illustrations
Revealing the Beauty of Biological Cells
TRACY HARE AND JENN FEIERABEND |



PART 2: TECHNOLOGY

- 36 **Terrific Tessellations**
Exploring Hands-on and Digital Tessellations
TRICIA FUGLESTAD
- 40 **3D Printing in the Art Room**
How to Get Started with 3D Printing
ALICE GENTILI
- 44 **Music-Infused Art**
An Interactive Art and Music
Collaboration
LINDA SCHOBER
- 48 **Radiant Robots**
Bringing Light to Art
LYNN BECK
- 52 **The World of Fractals**
Connecting Math, Science, and Digital Art
KEVIN FOGELSON
- 56 **Portrait Triptychs**
An Unusual Approach to Portrait Photography
MICHAEL SACCO
- 60 **Proofs & Spoofs**
Creating Movie Posters and Trailers
MELODY WEINTRAUB
- 64 **The Camera Obscura & Pinhole
Photography**
Building and Using a Pinhole Camera
NICOLE CROY


PART 3: ENGINEERING

- 70 **Steampunk Bugs**
Connecting Art and Engineering
LEIGH DRAKE
- 74 **Imagination Installations**
Newspaper Roll Sculptures
MOLLY MCNEECE
- 78 **Horse Sense**
A Yearlong Public Art Installation
SKIPPER BENNETT AND DEBRA STRANDBERG
- 82 **Mod Pods**
Building Modular Structures
NANCY WALKUP
- 86 **Building Castles of Their Own**
A Trial-and-Error Engineering Challenge
RACHEL WINTEMBERG
- 90 **Teaching Creative Thinking through
Architectural Design**
Effective Approaches to Teaching about the
Built Environment
KIJEONG JEON AND TERESA L. COTNER
- 94 **World's Longest Water Slide**
A Cardboard Model-Making Collaboration
RACHEL WINTEMBERG
- 98 **Cardboard Guitars**
Picasso-Inspired Cardboard Relief Sculptures
LUCY RUSSO



PART 4: MATHEMATICS

- 104 **The Art and Science of Trihexaflexagons**
Geometric Paper Constructions
PHYLLIS LEVINE BROWN
- 110 **The Many Faces of Giuseppe Arcimboldo**
Contemporizing a Historical Artist's Approach to Art
LEIGH DRAKE
- 114 **Taking a Turn**
Collaboratively Exploring Rotational Symmetry
TRICIA FUGLESTAD
- 118 **Color Wheel Windows**
Combining Radial Symmetry and Color Theory
STEPHANIE LEONARD
- 120 **Buzzing Bugs & Creepy Crawlies**
Where Art, Science, and Mathematics Meet
MARY COY
- 124 **Fold, Cut, Adhere**
Experimenting with Paper, Light, and Shadows
KARI GIORDANO
- 130 **Squaring the Circle**
Cut-Paper Symmetry Collage
JANE COPP
- 132 **Gridded by Design**
A Symmetrical Cut Paper Relief
MICHAEL SACCO



Nancy is standing at the Guggenheim Bilbao Museum in Bilbao, Spain. Designed by the architect Frank Gehry, it is a perfect marriage of art and engineering.

You Are a STEAM Teacher

Does your art curriculum include geometric concepts, two- and three-dimensional design, learning through discovery and invention, architecture or construction, nature, and technology? If so, you may not realize it, but you are a STEAM teacher. Art teachers were using STEAM long before it was ever a term or recognized for its strength.

Initially promoted by the Rhode Island School of Design, STEAM education is a response to STEM, an educational approach with a focus on the meaningful integration of science, technology, engineering, and math-

ematics. STEAM adds art to the acronym, underscoring the importance of innovation and creativity.

Through a quality STEAM approach to learning, students participate in engaging experiences to develop twenty-first century skills such as creativity and imagination, critical thinking, problem solving, and collaboration. Design thinking, a process that facilitates the design of objects, information, environments, and experiences, is also a natural component of STEAM.

The significance of STEAM is evidenced in a National Art Education Association

position paper on STEAM education, which supports the belief that “STEAM helps make learning concepts relevant and enticing to young children by highlighting how artists use STEM knowledge to enhance their art or solve problems. It also provides context for the importance of STEM knowledge in careers in the arts (e.g., musician, painter, sculptor, and dancer).”

Many art teachers are already working from a STEAM perspective but may not realize it. For example, if you are teaching about the natural world, the built environment, geometric concepts, types of symmetry, color theory, or using technology to create or share art, you may have a STEAM project. In a STEAM artroom, every project starts with art and connects one or more additional disciplines as they naturally apply. For instance, the concept of symmetry is readily found in art, math, and science. Mary Coy’s lesson, “Buzzing Bugs & Creepy Crawlies,” on page 120, is an example of the integration of these three disciplines. Over the course of the year in a STEAM program, students should work with all of the STEAM disciplines.

Whether you are a STEAM veteran or newbie, it will be a great benefit to your art program if you share what you and your students are doing with STEAM. Reflect on your own curriculum to consider how it may already work with STEAM, and don’t be shy about sharing your efforts. This could take the form of actual or online art exhibitions, murals, videos, blog posts, websites, articles, newsletters, or public presentations or performances to educate your administrators, other teachers, parents, and your community.

In this collection, aimed at elementary and middle-school students, *SchoolArts* offers a number of robust approaches to include STEAM in your curriculum. The articles were developed by art educators just like you and published in *SchoolArts* magazine. In each one, the addition of the arts to STEM is made more powerful because of the naturally interdisciplinary and engaging nature of the arts. STEAM also exemplifies the absolute necessity of art in an effective school program. For these reasons, we believe art teachers may be the best teachers of STEAM.



A STEAM Approach...

- is engaging to students.
- encourages creativity and innovation.
- values disciplines equally.
- seamlessly connects disciplines.
- presents open-ended problems that result in individual solutions.
- relates to students’ lives.
- is implemented through a wide variety of approaches.
- provides meaningful opportunities to collaborate with others.
- can lead to careers in the arts.
- just naturally makes sense.

Resources

- **Next Generation Science Standards**
nextgenscience.org
- **International Society for Technology in Education (ISTE) Standards**
iste.org/standards/for-students
- **Next Generation Engineering Design Standards**
nextgenscience.org/search-standards?keys=Engineering
- **Common Core State Standards for Mathematics**
corestandards.org/Math