

Biomimicry Unit Overview

By Mary Erickson, Ph.D. with art teacher Jennifer Poole; music teacher, Rebekah Osborne; dance teacher, Paige Levy and drama teacher, Kathy Anderson and 3rd grade students at Kyrene de la Paloma.

Biomimicry is a six-lesson unit plan designed in conjunction with the *Biomimicry* exhibition at the Gallery at Tempe Center for the Arts.

View the Biomimicry Exhibition Preview PowerPoint to see example contemporary artworks inspired by nature and biomimicry.

Themes

- *Theme in Life:* Plants and animals have developed amazing ways to solve problems so they can live and thrive.
- *Theme in Science:* Scientists identify problems in today's world and explore sustainable solutions already working in the lives of plants and animals.
- *Theme in Art:* Visual, performing and literary artists fascinated by the amazing abilities of plants and animals find exciting problems for their creative work.

Key Questions

Lessons approach the themes through these key questions:



What inspiration can I find in nature for my own visual or performing artwork?



What art, music, dance or drama elements will I use?

Community Connections

The challenges of living “green” in an large urban area in a desert has been a continuing challenge for the people of the Valley of the Sun. Tempe has a long tradition of community engagement. Many residents and business people and schools in the area are committed to sustainability.

For example, the city of Tempe strives to help citizens conserve water since we live in a desert environment. Tempe is a college town, so, there are nearly 11,000 people that bicycle to school or work on a regular basis instead of driving. There are also many degree programs and classes at ASU focused on environmental issues such as public transportation, clean energy and life sciences. Does your school or community have a particular interest in sustainable practices such as energy conservation or recycling?

Lessons

[One: Introduction to Biomimicry \(pdf\)](#)

[Two: Exploring Art Inspired by Nature \(Visual Art\) \(pdf\)](#)

[Three-Elementary: The Secrets of Orchids \(Visual Art\) \(pdf\)](#)

[Three-Secondary: The Secrets of Orchids \(Visual Art\) \(pdf\)](#)

[Four: Bio-Music with Birds \(Music\) \(pdf\)](#)

[Five: Dance of Bees \(Dance\) \(pdf\)](#)

[Six: Flight School \(Drama\) \(pdf\)](#)

Elementary Arizona Visual Arts Standards

VA.CR.2.3a: Create artwork using a variety of artistic processes, materials, and approaches. (Lesson Three-Elementary)

VA.PR.5.3: Identify appropriate exhibit space and prepare works of art for presentation and write an artist statement. (Lesson Three-Elementary)

VA.RE.8.3: Interpret art by referring to contextual information and analyzing relevant subject matter, elements and principles, and use of media. (Lesson Two)

VA.CN.11.3: Recognize that responses to art change depending on knowledge of the time and place in which it was made. (Lesson Two)

Secondary Arizona Visual Arts Standards

VA.CR3.HS1: Apply traditional, cultural, or contemporary criteria to examine, reflect on, and plan revisions for works of art and design in progress. (Lesson Three-Secondary)

VA.PR.6.HS1: Analyze and describe the impact that an exhibition or collection has on personal awareness of social, cultural or political beliefs and understandings. (Lesson Two)

VA.RE.8.HS1: Interpret an artwork or collection of works, supported by relevant and sufficient evidence found in the work and its various contexts. (Lesson Two)

VA.CN.10.HS1: Document the process of developing ideas that reflect group concerns from early stages to fully elaborated work. (Lesson Three-Secondary)

Elementary Arizona Music Standards (Lesson Four)

3.GM.CR.1.b: Generate musical ideas within specified tonality and/or meter.

3.GM.P.6.a: Perform music with appropriate expression and technique.

3.GM.CR.2.b: Use notation to document personal or collective rhythmic and melodic musical ideas.

3.GM.R.9.a: Apply teacher-provided and collectively developed criteria to evaluate musical works and performances.

National Anchor Standards (Lesson Five-Dance)

#2. Organize and develop artistic ideas and work.

#6. Convey meaning through the presentation of artistic work.

#10. Synthesize and relate knowledge and personal experiences to make art.

National Anchor Standards (Lesson Six-Theatre)

TH.PR.4.3b: Apply movement in voice in a theatrical work.

TH.PR.6.3: With prompting and support, use voice and sound dramatic play or a guided theatrical experience.

Arizona Science Standards (Lesson)

Strand 4 Concept 4 PO: Identify and describe adaptations of plants and animals that allow them to live in specific environments.

Strand 3 Concept 2 PO1: Identify ways people use tools and techniques to solve problems.

English Language Arts Standards

ELA-Literacy.CCRA.R4 : Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

ELA-Literacy.RST.6-8.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.

ELA-Literacy.RST.9-10.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

ELA-Literacy.CCRA.R1: Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

ELA-Literacy.RST.6-8.1: Cite specific textual evidence to support analysis of science and technical texts.

ELA-Literacy.RST.9-10.1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

ELA-Literacy.CCRA.R.9: Analyze how two or more texts [artworks] address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

ELA-Literacy.6-8.RH.9: Analyze the relationship between a primary and secondary source on the same topic.

ELA-Literacy.9-10.RH.9. Compare and contrast treatments of the same topic in several primary and secondary sources.

ELA-Literacy.CCRA.W1: Write arguments to support claims in an analysis of substantive topics or texts using valid reasoning and relevant and sufficient evidence.

ELA-Literacy.WHST.6-8.2f: Provide a concluding statement or section that follows from and supports the information or explanation presented.

ELA-Literacy.WHST.9-10.2f: Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

ELA-SL.2.3: Determine the main idea of a text read aloud or information presented in diverse media formats, including visually, quantitatively and orally.

ELA-RL.2.3: Recount stories; determine the central message, lesson, or moral and explain how it is conveyed through key details in the text.

Resources and Supplies

LESSON ONE

[Biomimicry Exhibition Preview PowerPoint](#)

[Introduction to Biomimicry PowerPoint](#)

[Biomimicry Mix and Match Cards pdf](#)

OPTIONAL

biomimicry.com

biomimicry.net

biomimicry.asu.edu

askabiologist.asu.edu

www.ted.com/talks (search “biomimicry”)

LESSON TWO

[Questor Questions about Art Inspired by Nature at the Tempe Center for the Art pdf](#)

LESSON THREE

[The Secrets of Orchids – ELEMENTARY PowerPoint](#) OR

[The Secrets of Orchids – SECONDARY PowerPoint](#)

[Labels for sketchbooks pdf](#)

6”X11” cardstock (folded in half to make book cover)

5 1/2”X18” 80 lb paper (folded to make book pages)

glue sticks

OPTIONAL: Ribbon to tie book closed
pencil and eraser
thin markers
printouts of orchid flowers and roots from the Internet
petal templates
oil pastels
watercolor paper 7 ½ X 11
water cups/water/paper towels
paint brushes

LESSON FOUR

[Bio-Music with Birds PowerPoint](#)
[Science Takes Wing PowerPoint](#) (From the ASU Ask a Biologist webpage “Birds and their Songs”)
<https://askabiologist.asu.edu/birding-educational-tools>
[Science Takes Wing II PowerPoint](#) (introduces bird calls with embedded recordings and a culminating quiz)
[Bird Call Recordings and Student Bio-Music Samples](#) (From Kyrene de La Paloma Elementary School Arts Integration website. These samples are slower for easier listening.)
<http://az01001083.schoolwires.net/Page/40767>

computers with speakers for small groups in the class
[Bird Call Grid worksheets pdf](#)
[Bird Call Spectrogram-Like Drawings for Arizona Birds handout pdf](#)
[Music Reflection worksheet pdf](#)
soprano recorders
audio recorder

OPTIONAL: Websites or YouTube videos with spectrograms of bird calls

LESSON FIVE

[Dance of the Bees Power Point](#)
[Job Cards pdf](#)
[Location Cards pdf](#)
Seek other online videos (search: “waggle dance of bees”)
large open area, such as a gym or play ground
balls, bean bags or other convenient objects to represent nectar in the Bee Game
smaller and larger containers for the Bee Game
Seek online outline for “Elements of Dance”

OPTIONAL: instructional resources from the ASU’s Ask the Biologist website.
[Bee Dance Game](http://askabiologist.asu.edu/bee-dance-game) <http://askabiologist.asu.edu/bee-dance-game>
[About Honey Bees](https://askabiologist.asu.edu/explore/honey-bees) <https://askabiologist.asu.edu/explore/honey-bees>
[Virtual Bee Hive](https://askabiologist.asu.edu/games-and-simulations/virtual-reality-tours-biology) <https://askabiologist.asu.edu/games-and-simulations/virtual-reality-tours-biology>

LESSON SIX

[Flight School PowerPoint](#)
[How Do Birds Fly?](#) (From ASU Ask a Biologist) <https://askabiologist.asu.edu/how-do-birds-fly>
[Feather Biology](#) (From ASU Ask a Biologist) <https://askabiologist.asu.edu/explore/feather-biology#paper>
sheets of thin paper (See “Feather Functions” on Feather Biology webpage for paper experiment)

RECOMMENDED:

[2-page text of *Flight School* Script pdf](#)

[Script Worksheet pdf](#)

[Alternative Script Worksheet pdf](#)

*Book: Crafty Puppets by Thomasina Smith, 1999, Gareth Stevens Publishing, Milwaukee, WI
(See Big Beaky Bird section.)*

Illustrated Children's Book: *Flight School* by Lita Judge, 2014, Atheneum Books for Young Readers

socks (black, white, pink and brown for puppets)

card stock and double stick tape (for beaks)

feathers

google eyes

crepe paper (for head plumes)

sticky foam (for wings)

hot glue gun

puppet theater (SUGGESTIONS: short lengths of landscaping logs, heavy cord for pier and craft paper for Flight School banner and painting of sea life under the stage)

toy boat for penguin

small birds on black sticks as "extras"

NOTE: See [Kyrene de La Poloma Arts Integration Website](#) for sample videos of 3rd grade performances. Click on "Biomimicry", then on "3rd Grade Biomimicry".
<http://az01001083.schoolwires.net/Page/40767>

Website

[Ask a Biologist https://askabiologist.asu.edu](https://askabiologist.asu.edu)

Credits

Linda Crain

Lena Hubin

Debbie Schweikardt, Arizona Bird Store

Jessie Hauer, ASU Science is Fun

Charles Kazilek, ASU Ask a Biologist

Author Lita Judge

Kyrene de la Paloma Elementary School Chandler, AZ

Estimated Time

Lesson One= 30 minutes

Lesson Two = Field Trip

Lesson Three-Elementary = 160 minutes

Lesson Three-Secondary = 160 minutes

Lesson Four = 160 minutes

Lesson Five = 120 minutes

Lesson Six = 160 minutes