IMPROVING TEACHER QUALITY
Arts and Science Integration

Visual Art and Life Science

Grade 3

Spring 2013

ITQ ARTS AND SCIENCE INTEGRATION
GRADE 3
VISUAL ART AND LIFE SCIENCE

Scientific Observational Drawing
LESSON #1

- *FOSS Kit Grade 3*, Life Science: Structures of Life, Investigation 1 and 2

CONTENT STANDARDS

Visual Art
2.1 Explore ideas for art in a personal sketchbook.
Life Science
LS3 Adaptations in physical structure or behavior may improve an organism's chance for survival. As a basis for understanding this concept:
LS3a Students know plants and animals have structures that serve different functions in growth, survival and reproduction.

ESSENTIAL QUESTIONS *(Questions students might ask about the topic)*

- Why do scientists use field journals or field books in their work?
- What do scientists' field journal look like?
- How can I create a series of drawings of a peanut depicting the whole peanut seed coat, the seed coat split, and the seed coat split with the cotyledon(s) removed that looks realistic?

OBJECTIVES & STUDENT OUTCOMES (Students will be able to…)

- Discuss why scientists use field journals, sketches and drawings for data collection.
- Create a series of realistic sketches and drawings of a peanut depicting the whole peanut seed coat, the seed coat split, and the seed coat split with the cotyledon(s) removed.

ASSESSMENT *(Various strategies to evaluate effectiveness of instruction and student learning)*

- **Feedback for Teacher**
  - Informal assessment of student skill and understanding from observation
  - Formal Assessment: *Scientific Observational Drawing Class at a Glance Checklist*
- **Feedback for Students**
  - Informal verbal feedback from teacher
  - Direction and suggestions from individual conferences throughout work process.

WORDS TO KNOW

Visual Art Vocabulary

- **Observation:** The action or process of observing something carefully in order to gain information, the ability to notice significant details.
- **Sketch:** A rough or unfinished drawing or painting, often made to assist in making a more finished picture
- **Visual Memory:** Remembering how something looks

Life Science Vocabulary

- **Embryo**: The underdeveloped plant within a seed
- **Hull**: A hard, protective shell covering a seed
- **Field Journal or Field Book:** a book in which a surveyor, technician or scientist writes down measurements and other technical notes taken in the field
- **Property:** an observed characteristic of an object, such as size, color, shape, texture, smell and so on.
- **Seed:** the structure in a fruit that holds the underdeveloped plant, or embryo

- **Seed Coat:** The outer covering of a seed.
- **Structure:** Any identifiable part of an organism.

MATERIALS

- Photograph of a whole peanut, photograph of a broken peanut with seeds visible
- 9" x 12" white construction paper
- pencil, eraser, one per student
- ruler, one per student
- science notebook, one per student

RESOURCES

- *FOSS Kit Grade 3*, Life Science: Structures of Life, Investigation 1 and 2
- *Portfolios Grade Three*, by Robyn Montana Turner, Barrett Kendall Publishing
    - How to Make a Sketchbook page 7
    - How to Use a Sketchbook page 20, 42, 64, 77, 86, 91, 108, 130
- Internet Websites:
    - Leonardo da Vinci's Sketchbooks http://www.unmuseum.org/leosketch.htm
    - Guild of Scientific Illustrators http://www.gnsi.org/science-illustration
    - Complete article*: Sketching as a Science Tool* by: Diana T. Sands and Lorie Topinka http://cf.synergylearning.org/displayarticle.cfm?selectedarticle=564
    - American Museum of Natural History Field Journals: http://www.amnh.org/nationalcenter/online_field_journal/index.html
    - Images:
        - Field journals: http://katwalkdesigns.blogspot.com/
        - Photo of Peanuts: http://i1.squidoocdn.com/resize/squidoo_images/-1/lens3561012_1238301364peanuts.jpg
- Instructional Media Center (IMC)
  2441 Cardinal Lane, San Diego, CA 92123

PREPARATION *(To be completed prior to the lesson)*

- In FOSS Kit Grade 3, Life Science: Structures of Life, Investigation 1, Part 2 students are given the opportunity to draw repeatedly, a seed, and its progress during sprouting over a period of time. The notebook master (FOSS Kit Grade 3, Life Science Teacher Guide page 186) gives students very small areas, about ¾" x 1 ½ " to draw their observations. This lesson is meant to give students the opportunity to draw in a much larger area therefore allowing the students to draw with increased detail. This lesson should be used in conjunction with Investigation 1, Part 2.

WARM UP *(Engage students, access prior learning, review, hook or activity to focus the student for learning)*

- Place the article "**Sketching** as a Science Tool" under a document camera and project it in an area easily seen by all students.
- *Ask:*
    - *"What do you see here on this page?"* [sketch of a bird sitting on a windowsill, writing on the facing page]
- Read the title of the article out loud and then ask:
    - *"What does the word "**sketching**" mean?"* [a rough or unfinished drawing or painting, often made to assist in making a more finished picture]
    - "*What do you think the term "science tool" means?"* [something used in the systematic study of the physical and natural world through **observation** and experimentation]
- Read the article out loud to the students, stopping at bolded vocabulary words to explore meaning.
- Ask when appropriate:
    - *"What is a **field journal**?"* [a book in which a surveyor, technician or scientist writes down measurements and other technical notes taken in the field]

- *"What is an **observation**?"* [The action or process of observing something carefully in order to gain information, the ability to notice significant details.
- "What is a **visual memory**?" [Remembering how something looks]

- When you have finished reading the article, allow students to discuss what they see in the photograph of the **field journal**.

MODELING *(Presentation of new material, demonstration of the process, direct instruction)*

- Distribute a ruler, 9 x 12 white piece of construction paper, pencil, and an eraser to each student.
- Demonstrate how and instruct students to do the following:
  - Fold the construction paper in half with the short sides of the rectangle together.
  - Unfold the paper carefully and draw a line on the fold using the ruler.
  - Turn the paper to landscape orientation.
  - Display or project the photograph of a whole peanut in an area easily seen by all students.
  - Allow 1 minute to visually examine the peanut silently. (Let students know when 15, 30 and 45 seconds have passed so they continue to concentrate.)
- *Ask:*
  - *"What are the observable **properties** of this peanut?"* [size, shape, color, texture, etc.]
  - *"Which of those **properties** can you show in a drawing?"* [shape, color, texture, size]
- Explain that the students are going to draw the peanut two times on the left side of the paper.
- In both drawings, the students are going to draw the peanut much larger than it really is.
- Demonstrate how and instruct students to measure the peanut visually. Hold your fingers up in space and visually place a thumb at one end and a pointer finger at the other end of the peanut. Sometimes closing one eye can help a student perceive the image more clearly.
- Make two marks on the left side of the construction paper toward the top 4 inches apart using the ruler.
- Explain that each student should try to draw the peanut touching each of the dots making the drawing about 4 inches wide.
- Demonstrate how and instruct students to sketch the outside shape of the peanut on the construction paper under the document camera. When you are satisfied with your sketch marks, outline the shape with slightly heavier lines.
- Demonstrate how and instruct students to use lines, shapes and shading to create a pattern representing the texture of the peanut. .
- Allow students time to finish this first drawing of the peanut.

GUIDED PRACTICE *(Application of knowledge, problem solving, corrective feedback)*

- When students have completed the first drawing ask:
  - *"What part of the peanut plant is the peanut you just drew?"* [the fruit]
- Project the second image of a peanut broken open..
- Direct students to make 2 light dots in the lower half of the left hand side of the white construction paper 4 inches apart.
- Instruct the students to use these dots as the outer edges of the new drawing of the peanut and its seed or seeds.
- Remind students to draw what they actually see and observe.
- Move around the classroom and conference with individual students about their progress.
- When the class has completed the second drawing*, ask:*
  - "*What part of the peanut would be considered the **hull**?"* [peanut shell]
  - "*What part of the peanut would be considered the **seed coat**?* [thin skin over the seed]
  - *"What part of the peanut would be considered the actual **seed**?"* [the part we eat]
  - *"Can you find the **embryo** in the **seed**?" [open the seed or nut and find the place where the embryo would begin to develop]*
- Demonstrate how and instruct students to add the words seed coat, seed, and embryo around the perimeter of the second drawing and use the ruler to draw lines to the appropriate **structures**.

DEBRIEF & REFLECT *(Identify problems encountered, ask and answer questions, discuss solution and learning that took place. Did students meet outcomes?)*

- *Ask:*
  - *"How does this paper with the two drawings on left resemble the filed journal images we examined at the beginning of this lesson?"*
- Project the botanical illustration of the peanut plant and discuss the structures.
- Instruct students to write about the properties of the peanut that were impossible to illustrate in the drawings on the right side of the white construction paper.
- Science Notebook Prompt: Add this "field journal" example to each student's science notebook.

EXTENSION *(Expectations created by the teacher that encourage students to participate in further research, make connections, and apply understanding and skills previously learned to personal experiences.)*

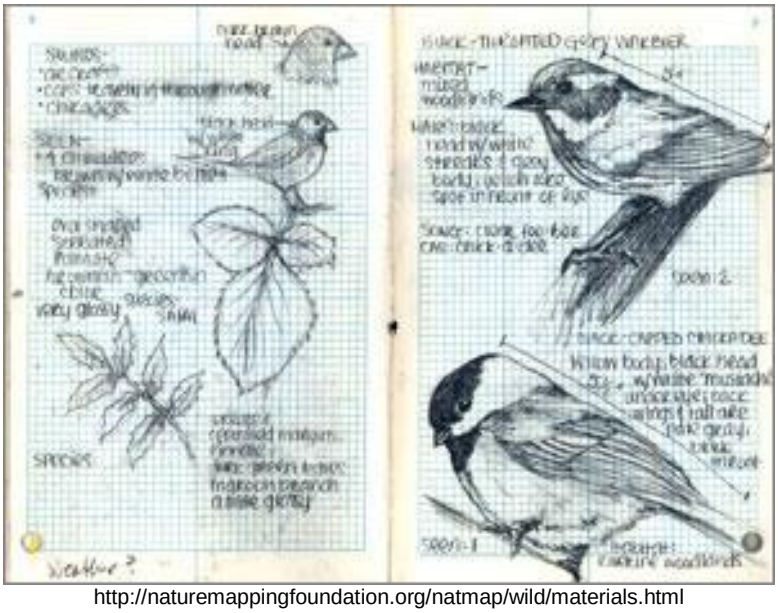
- Deeper learning will take place if an actual fruit can be examined, observed and drawn.
- If possible, provide a piece of fruit (apple, orange, avocado) for each student. Allow them to draw the fruit three times: whole, cut open, and then the seed removed.

Sketching as a Science Tool

"The most important thing we can teach our young people is to observe well."
-Ernst Mayr, famous biologist

For all kinds of scientists, keeping a **field journal** is a necessary part of their work. A field journal is a book or notebook where scientist record data, write their ideas and questions and sketch their **observations**. A field journal is a place where the details of research and experiments can be recorded and new questions are considered. By making connections on the pages of a field journal, scientists link their observations and their visual memory.

A field journal is a combination journal for writing and sketchbook for drawing. Scientists must make good use of their **visual memories** when they make their **sketches** in their field journals. The act of sketching requires long periods of looking carefully at the subject or object. Sketching for scientific data collection also requires repeated drawing of the same object in different ways. Sketching helps scientists and artists develop minds that ask questions and search for answers. Here is an example of a field journal:



http://naturemappingfoundation.org/natmap/wild/materials.html

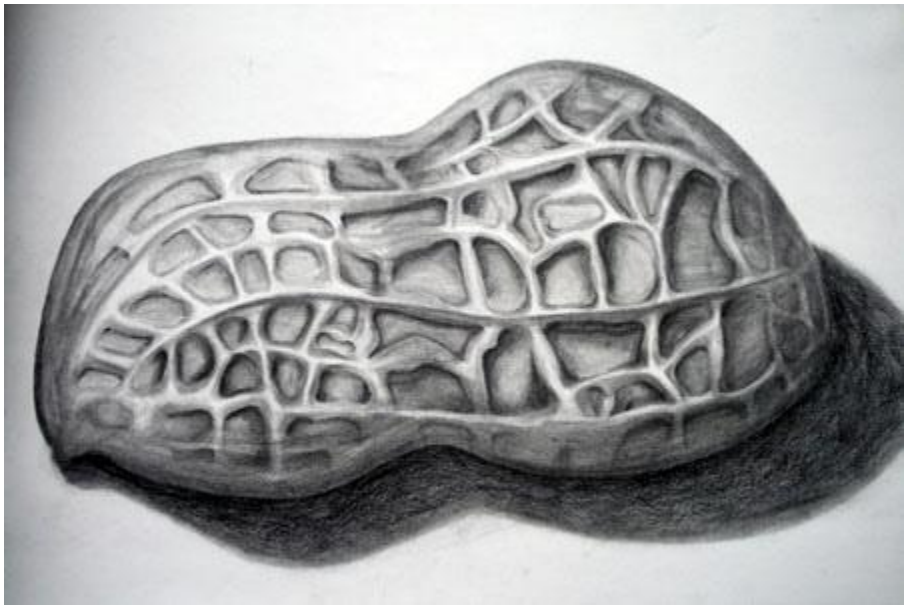
Informational text from: Synergy Learning, *Sketching as a Science Tool* by: Diana T. Sands and Lorie Topinka
http://cf.synergylearning.org/displayarticle.cfm?selectedarticle=564

42-16690140 [RF] © www.visualphotos.com

http://www.visualphotos.com/photo/2x2718809/whole_peanut_shell_42-16690140.jpg

http://www.peanut-machine.com/FAQ/Usage-of-Peanut-Shell-for-Peanut-Shelling-Machine.html

Drawing #1



http://www.flickr.com/photos/farween/2364540555/

Drawing #2

http://www.flickr.com/photos/icemancast/3689059488/lightbox/

Drawing #3

http://lemarceldogbakery.com/about_ingredients.php

http://www.zazzle.com/peanut_botanical_drawing_letterhead-199431427397882854

ITQ ARTS AND SCIENCE INTEGRATION
GRADE 3
VISUAL ART AND LIFE SCIENCE

The Science of Botanical Illustration
LESSON #2

- *FOSS Kit Grade 3*, Life Science: Structures of Life, Investigation 2 Growing Further

CONTENT STANDARDS

Visual Art

2.4 Create a work of art based on the observation of objects and scenes in daily life, emphasizing value changes.

Life Science

LS3 Adaptations in physical structure or behavior may improve an organism's chance for survival. As a basis for understanding this concept:
LS3a Students know plants and animals have structures that serve different functions in growth, survival and reproduction.
I&E5 Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations. Students will:
I&E5e Collect data in an investigation and analyze those data to develop a logical conclusion.

ESSENTIAL QUESTIONS *(Questions students might ask about the topic)*

- What is a botanical illustration?
- What are the structures of plants?
- How does creating a botanical illustration help me to learn more about the structures of plants?

OBJECTIVES & STUDENT OUTCOMES (Students will be able to…)

- Create a botanical illustration.
- Identify and describe the basic structures of a bean, pea, corn and sunflower.
- Write a reflection on how botanical illustrations help us learn about plants.

ASSESSMENT *(Various strategies to evaluate effectiveness of instruction and student learning)*

- **Feedback for Teacher**
  - Informal Assessment of student skill by observation
- **Feedback for Students**
  - Informal verbal feedback from teacher
  - Direction and suggestions from individual conferences throughout work process

WORDS TO KNOW

Visual Art Vocabulary

- **Botanical Illustration**: a scientific drawing or painting of plants, including their function and structure. Most often is created life size or in scale, shows the face and reverse side of leaves, flower, bud, seed and root system.
- **Observation:** The action or process of observing something or someone carefully or in order to gain information
- **Observational drawing skills:** Skills learned while observing firsthand the object, figure or place
- **Scale:** Relative size, ratio

- **Sketch:** A rough or unfinished drawing or painting, often made to assist in making a more finished picture

Life Science Vocabulary

- **Cotyledon:** The "seed leaf" that provides the germinated see with food.
- **Embryo:** the underdeveloped plant within a seed.
- **Flower:** A Structure of a plant that grows into fruit.
- **Function:** A kind of action, such as the function of a body part.
- **Hull:** A hard, protective shell covering a seed.
- **Leaf:** A structure on a plant that is usually green and makes food from sunlight.
- **Root:** That part of the plant that grows downward in the soil. Roots provide support and take up water and nutrients.
- **Seed:** The structure in a fruit that olds the underdeveloped plant, or embryo**.**
- **Seedling:** A baby plant.
- **Stem**: Any stalk supporting leaves, flowers or fruit.

MATERIALS

- Botanical illustration of bean
- Chart paper
- Marker
- 12" x 18" white construction paper, one per student
- pencil and eraser, one per student
- set of at least 8 colored pencils, one per student
- Completed Bean Plant Life Cycle (Teacher Guide page 190), one per student OR Bean Life Cycle Images (Teacher Guide page 217), one per student

RESOURCES

- *FOSS Kit Grade 3*, Life Science: Structures of Life, Investigation 2 Growing Further
- *Portfolios Grade Three*, by Robyn Montana Turner, Barrett Kendall Publishing
  - Flowers: page 30, 31
- Websites:
  - Sunflowers: http://arboretum.unl.edu/webimages/giftshop/sunflowerHelm.jpeg
  - Pea: http://www.patschories.com/images/botanical/Peas.jpeg
  - Bean: http://4.bp.blogspot.com/_f_rUi6kjzJ0/SWq2_-7cFjI/AAAAAAAABeY/5EcJizdMkQw/s400/bean.jpg
  - Corn: http://vintageprintable.com/wordpress/wp-content/uploads/2009/05/zea-mays-corn.jpg
  - Peanut: http://upload.wikimedia.org/wikipedia/commons/a/a4/Arachis_hypogaea_-_Köhler–s_Medizinal-Pflanzen-163.jpg
  - Botanical Illustration Guide for Educators: http://www.aucklandmuseum.com/site_resources/library/Visit_Us/WhatsOn/Exhibitions/2009_Exhibitions/Wonderland/Education/Wonderland_Botanical_Illustration_Guide(2).pdf
- Instructional Media Center (IMC)
  2441 Cardinal Lane, San Diego, CA 92123

PREPARATION *(To be completed prior to the lesson)*

- The students will need their completed worksheets from *FOSS Kit Grade 3*, Structures of Life, Investigation 2: Growing Further, Part 2: Life Cycle of the Bean. The worksheet can be found in the Teacher Guide page 190.
- If students have not completed the worksheet, then each student needs a copy of "Bean Life Cycle Images" from the Teacher Guide, page 217.

WARM UP *(Engage students, access prior learning, review, hook or activity to focus the student for learning)*

- Display the botanical illustration of a bean found at the end of this lesson in an area easily

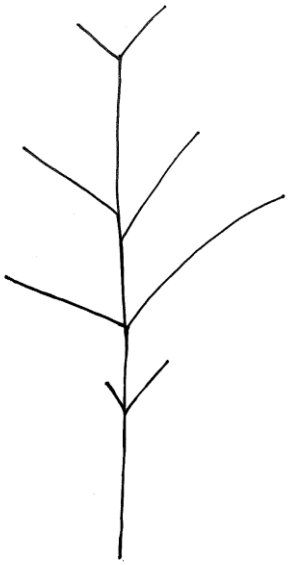
seen by all students under a document camera or project the image from the internet: http://4.bp.blogspot.com/_f_rUi6kjzJ0/SWq2_-7cFjI/AAAAAAAABeY/5EcJizdMkQw/s400/bean.jpg

- Instruct students to silently examine the image for one minute.
- *Ask:*
  - *"What do you see?"* [a detailed, colored picture of a bean in many different stages of its life]
  - *"Do you think this illustration was completed in a scientific field journal? Why or why not?* [There is no right or wrong answer to this question. Make sure students analyze the projected image comparing how a field journal image is created in the field.]
- Distribute the student's completed worksheets from *FOSS Kit Grade 3*, Structures of Life, Investigation 2: Growing Further, Part 2: Life Cycle of the Bean.
- *Ask:*
  - *"How is the projected image of the bean different from your worksheets?* [Each stage of the bean life cycle is contained within an oval and in a particular order, the other is not]
- Write "**Botanical Illustration**" on the top of a sheet of chart paper.
- As the students share the following characteristics of a **Botanical Illustration**, list them on the chart paper.
  - Stages of the life cycle are evident, not encircled
  - Main plant tends to be central, with stages around and toward the bottom of the illustration
  - Illustrations are accurate
  - Plant parts are identifiable
  - Size of plant and plant parts are to **scale**

MODELING *(Presentation of new material, demonstration of the process, direct instruction)*

- *Say:*
  - *"The projected image is called a **Botanical Illustration**. A **botanical Illustration** is a scientific drawing or painting of plants, including their physiology and structure. Most often **botanical illustration** is created life size or to **scale** and shows the face, reverse side of leaves, flower, bud, seed and root system."*
  - *"Many centuries ago people used **botanical illustrations** to record all kinds of information, especially to identify plants and to share their medicinal uses. It was especially important to share which plant were dangerous."*
  - *"This style of drawing became popular during the Middle Ages. During the Age of Discovery (16th Century) artists went on voyages to new lands and drew the plants, animals and landforms they found to record the discoveries."*
- Distribute 9" x 12" white construction paper, a pencil and an eraser to each student.
- Demonstrate how and instruct students to turn the paper to portrait orientation.
- *Say:*
  - *"Today, we are going to draw the bean plant on this construction paper in a **botanical illustration** style."*
  - *"Planning is an important step in any drawing."*
- *Ask:*
  - *"Which of the oval drawings from the worksheet should be the largest and placed toward the center of our **botanical illustration**?"* [the oval that illustrates the plant with full grown bean pods]
- Demonstrate how to estimate the size of this central plant on the drawing paper. Have students place their pointer fingers at the top and bottom of the area they will use to draw the central image of the plant.
- Check each student's fingers for correct placement and size.
- Demonstrate how and instruct students to lightly **sketch** a line for the main **stem** and the 8 branches from the worksheet drawing.
- *Say:*
  - *"Notice how the main **stem** is basically straight and the **leaf** and bean **stem**s grow out two at a time at the same point on the main **stem**."*

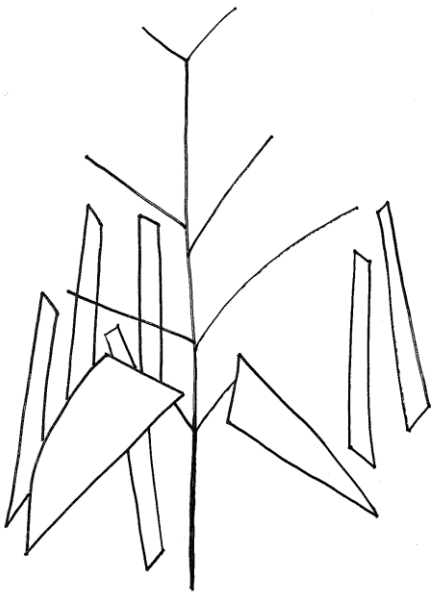
Illustration #1



- *Ask:*
  - *"Which bean **leaf** looks like it is the closest to us?"* {the leaf on the lower left]
  - *"What basic geometric shape is that **leaf**?"* [elongated triangle]
- *Say:*
  - *"Remember we are still in the planning stage of this **botanical illustration**."*
  - *"Place your thumb at the place on your drawing where the pointed end of the closest **leaf** should appear."*
  - *"Place your pointer finger at the place where the wide end of the **leaf** should appear."*
- Check each student's fingers for correct placement.
- Demonstrate how and instruct students to lightly sketch an elongated triangle in the space they identified on their **botanical illustration**.
- *Say:*
  - *"Now let's look at the lowest **leaf** on the right side of the bean plant drawing from the science worksheet."*
- *Ask:*
  - *"How is it the same as the first **leaf**?* [shape, texture]
  - *" How is it different?"* [size]
- Demonstrate how and instruct students to place thumb and pointer finger in the correct place on their **botanical illustration**, adjusting for size.
- Demonstrate how and instruct students to lightly **sketch** a triangle representing the lowest **leaf** on the right side.
- Say:
  - *"How many bean pods do you see on the left side of the plant?"* [4]
  - *"On the right?"* [2]
  - *"What geometric shape would you use for the bean pods?"* [elongated rectangle]
  - *"How are the beans pods on the right different than those on the left?"* [bean pods on the left are behind the lowest leaf]
  - *"How do you know the bean pods on the left are behind the lowest **leaf** on the left?"* [part of the bean pods are not visible]

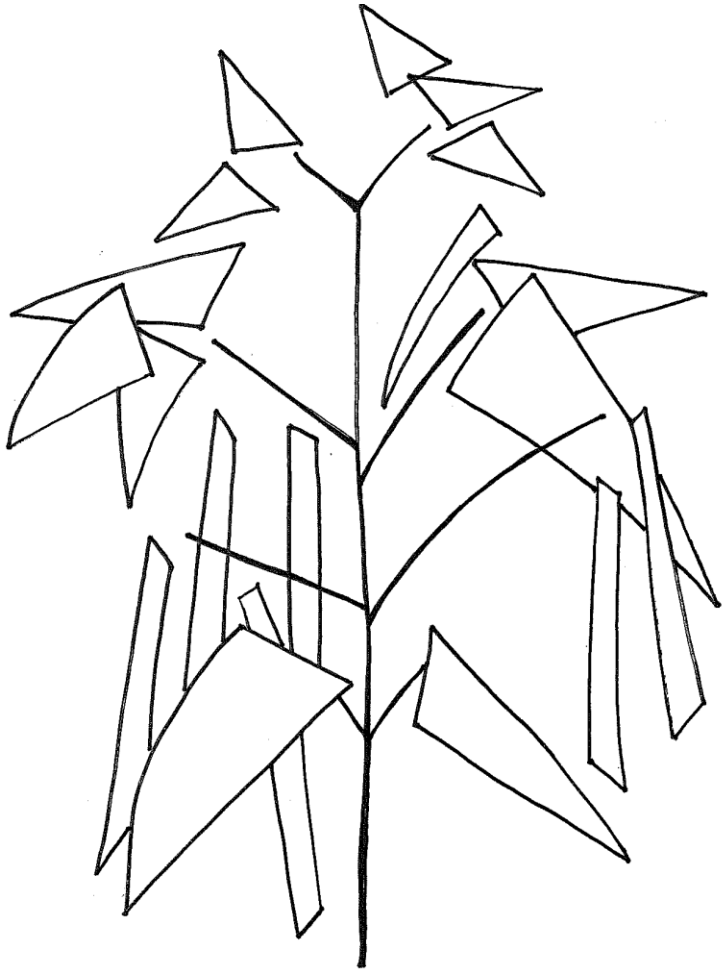
- Demonstrate how and instruct students to lightly **sketch** elongated rectangles representing the bean pods.

Illustration #2



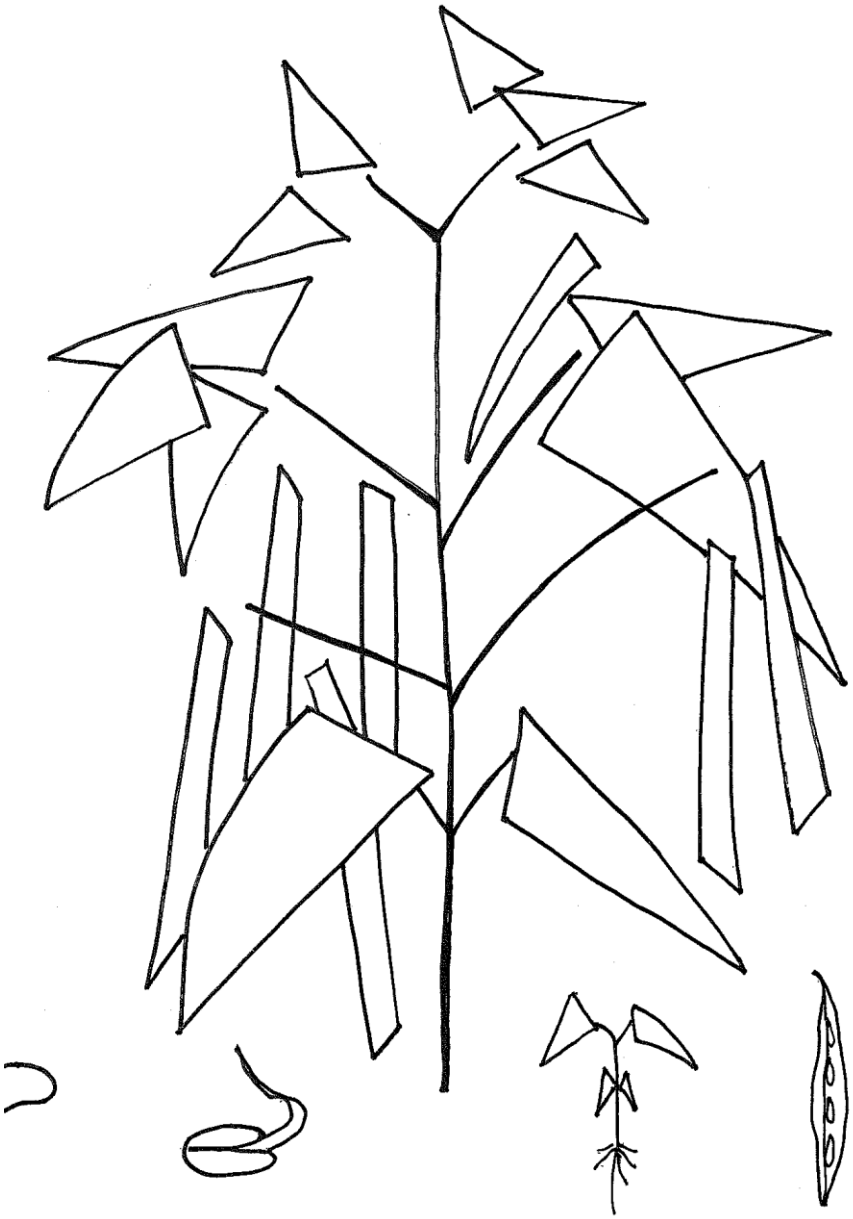
- Direct students to continue to plan and lightly **sketch** their **botanical illustration** using their fingers to determine size and placement of geometric shapes representing the rest of the leaves of the bean plant.

Illustration #3



- When students have completed their light **sketch,** *say:*
  - *"Let's look at the **botanical illustration** we examined at the beginning of the lesson and then at the other stages of the life cycle of the bean from our worksheet."*
- *Ask:*
  - *"Are the life cycle illustrations in a particular order in the **botanical illustration** of the bean?"* [no, but each illustration is numbered]
- *Say:*
  - *"Remember, we are still in the planning stage of the **botanical illustration**."*
  - *"Later we will go back and make more specific shapes and add important details."*
  - *"Lightly sketch the seed, the sprouted seed, the seedling, the flowered bean plant and the bean pod showing the seeds inside the seed coat on your botanical illustration."*
  - *"Remember to use pencil lightly and use geometric shapes, not specific details."*
- Give students enough time to get the basic shapes and lines of the seed, sprouted seed, the seedling, the flowered bean plant and the bean pod showing the seeds inside the seed coat sketched onto their drawing paper.

Illustration #4



GUIDED PRACTICE *(Application of knowledge, problem solving, corrective feedback)*

- *Say:*
  - *"Who can tell me what part of the bean plant we drew first?"* [stem]
  - *"How can we make the sketch we drew look more like a real **stem**?"* [the stem is not a line, make the **stem** thicker at the bottom and gradually thinner toward the top]
- Demonstrate how and instruct students to re-draw the **stems** by adding parallel lines that are slightly farther apart toward the bottom and closer toward the top. These lines should be slightly heavier than the sketched lines.
- Demonstrate how and instruct students to use an eraser only if necessary in small areas.
- Demonstrate how and instruct students to **observe** the drawings on their worksheet and adjust the shapes of the **leaves** and bean pods by adding heavier, curved lines where appropriate and erasing only as needed.

Illustration #5

- Instruct students to adjust shapes and add details to the other plant structures in the botanical illustration: **seed, seed coat**, sprouted seed, **seedling**, **seed coat** with seeds showing inside.
- By the end of this class session students should have completed a realistic drawing of the bean plant and its structures in pencil.
- Instruct students to write their names on the back of the drawing toward the lower right edge of the drawing paper.

DEBRIEF & REFLECT *(Identify problems encountered, ask and answer questions, discuss solution and learning that took place. Did students meet outcomes?)*

- Tell students to stand in a circle around the classroom.
- Show students how to hold their **botanical illustrations** in front of themselves with the top if the paper at chin level.
- Instruct students to turn their eyes to a particular student's work of art then let their eyes move clockwise to the next work of art. When students have looked at everyone's works of art, collect and store them to be used again for Visual Art/Life Science Grade 3 Lesson #3.
- Science Notebook Prompt: *How do **botanical illustrations** help us learn about plants?*

EXTENSION *(Expectations created by the teacher that encourage students to participate in further research, make connections, and apply understanding and skills previously learned to personal experiences.)*

- Encourage students to create **botanical illustrations** of living plants in their home environment including research of plant names, structures and functions.
- Allow students to compare their own botanical illustration drawn from the FOSS kit worksheet to the professional botanical illustration of a bean at the end of this lesson.

Botanical Illustrations: Bean

http://redhousedesign.blogspot.com/2009/01/botanical-illustrations.html

Botanical Illustration: FAVA BEAN

http://starssucculentandcactus.blogspot.com/2010/10/two-beautiful-beans-fava-scarlet-runner.html

ITQ ARTS AND SCIENCE INTEGRATION
GRADE 3
VISUAL ART AND LIFE SCIENCE

The Science of Botanical Illustration
LESSON #3

- *FOSS Kit Grade 3*, Life Science: Structures of Life, Investigation 2 Growing Further

CONTENT STANDARDS

Visual Art
2.4 Create a work of art based on the observation of objects and scenes in daily life, emphasizing value changes.

Life Science
LS3 Adaptations in physical structure or behavior may improve an organism's chance for survival. As a basis for understanding this concept:
LS3a Students know plants and animals have structures that serve different functions in growth, survival and reproduction.
I&E5 Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations. Students will:
I&5e Collect data in an investigation and analyze those data to develop a logical conclusion.

ESSENTIAL QUESTIONS *(Questions students might ask about the topic)*

- What is value and how is it used in illustrations?
- How can I use watercolor paint to complete a botanical illustration?
- How does creating a botanical illustration help me to learn more about the structures and function of plants?

OBJECTIVES & STUDENT OUTCOMES (Students will be able to…)

- Complete a botanical illustration of a bean by illustrating the seed, sprouted seed, seedling, flowering plant, fruited plant, and bean pod.
- Identify and describe the basic structures of a plant including cotyledon, embryo, flower, hull, leaf, root, and stem.
- Write a reflection on the learning that took place through the illustration process.

ASSESSMENT *(Various strategies to evaluate effectiveness of instruction and student learning)*

- **Feedback for Teacher**
  - Informal Assessment of student skill and understanding from observation
  - Formal Assessment: Botanical Illustration Rubric
- **Feedback for Students**
  - Informal verbal feedback from teacher
  - Direction and suggestion from individual conferences throughout work process
  - Formal Assessment: Botanical Illustration Rubric

WORDS TO KNOW

Visual Art Vocabulary

- **Blending:** To merge one color with another.
- **Blotting:** To dry a wet surface using an absorbent material.

- **Cake:** A flattish, compact mass of something (watercolor paint).
- **Intensity:** Refers to the brightness of a color, a measurable amount of property as in brightness.
- **Palette:** A flat board on which an artist holds and mixes colors.
- **Transparent:** Allowing light to pass through so that objects behind can be distinctly seen.
- **Value:** Lightness or darkness of a hue or neutral color.
- **Wash:** To lay a large area of watercolor paint onto the surface, usually as a background layer.
- **Watercolor:** The art of painting with watercolors, esp. using a technique of producing paler colors by diluting rather than by adding white.
- **Wet on wet:** The use of wet paint on a wet surface.

Life Science Vocabulary

- **Embryo:** the underdeveloped plant within a seed.
- **Flower:** A Structure of a plant that grows into fruit.
- **Leaf:** A structure on a plant that is usually green and makes food from sunlight.
- **Nutrients:** A material required by a living organism to help it grow and develop.
- **Root:** That part of the plant that grows downward in the soil. Roots provide support and take up water and nutrients.
- **Seed:** The structure of a plant that grows downward in the soil. Roots provide support and take up water and nutrients.
- **Seed Coat:** The outer covering of a seed.
- **Seedling:** A baby plant.
- **Stem**: Any stalk supporting leaves, flowers or fruit.

MATERIALS

- 9” x 12” white construction paper, one per student
- water container with water
- large round or sponge paint brush, one per student
- watercolor paint brush, size 9 (usually included in watercolor set), one per student
- watercolor paint brush size 6, one per student
- set of 8 color watercolor paints, one per student
- 6” white paper plate, one per student
- 2 paper towels
- white crayon, one per student
- 12” x 18” Botanical illustration drawn in pencil during the previous lesson, Lesson #2, The Science of Botanical Illustration, one per student
- Reproduction of a colored botanical illustration of a bean (see end of this lesson)

RESOURCES

- *FOSS Kit Grade 3*, Life Science: Structures of Life, Investigation 2 Growing Further
- *Portfolios Grade Three*, by Robyn Montana Turner, Barrett Kendall Publishing
  - Flowers: page 30, 31
- Websites:
  - Watercolor Techniques for Kids: http://www.buzzle.com/articles/watercolor-techniques-for-kids.html
  - Watercolor Techniques: http://www.painting-ideas-and-techniques.com/watercolor-techniques.html
  - Sunflowers: http://arboretum.unl.edu/webimages/giftshop/sunflowerHelm.jpeg
  - Pea: http://www.patschories.com/images/botanical/Peas.jpeg
  - Bean: http://4.bp.blogspot.com/_f_rUi6kjzJ0/SWq2_-7cFjI/AAAAAAAABeY/5EcJizdMkQw/s400/bean.jpg
  - Corn: http://vintageprintable.com/wordpress/wp-content/uploads/2009/05/zea-mays-corn.jpg

- Peanut: http://upload.wikimedia.org/wikipedia/commons/a/a4/Arachis_hypogaea_-_Köhler–s_Medizinal-Pflanzen-163.jpg
- Botanical Illustration Guide for Educators: http://www.aucklandmuseum.com/site_resources/library/Visit_Us/WhatsOn/Exhibitions/2009_Exhibitions/Wonderland/Education/Wonderland_Botanical_Illustration_Guide(2).pdf

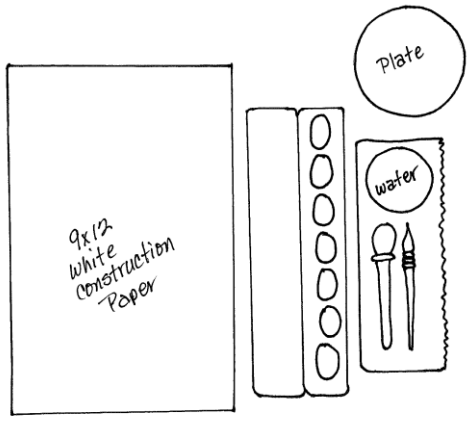
- Instructional Media Center (IMC)
  2441 Cardinal Lane, San Diego, CA 92123

PREPARATION *(To be completed prior to the lesson)*

- The students will need their botanical drawings from ITQ Arts and Science Integration Grade 3 Visual Art and Life Science, Lesson 2: *The Science of Botanical Illustration*.
- *FOSS Kit Grade 3*, Structures of Life, Investigation 2: Growing Further, Part 2: Life Cycle of the Bean

WARM UP *(Engage students, access prior learning, review, hook or activity to focus the student for learning)*

- Distribute one 9" x 12" white construction paper, one large round or sponge brush, one size 9 watercolor paint brush (usually included in **watercolor** set), one size 6 watercolor paint brush, one tray of 8 color **watercolor** paints, a white crayon and two paper towels to each student
- Demonstrate how to set up the distributed tools in an organized manner under the document camera and instruct students to set up their workspace in a similar way.
  - Place both **watercolor** paintbrushes on one of the folded paper towels on the dominant hand side for easy access and less possibility of dripping on the work of art.
  - Place water in a container toward the top or far end of the folded paper towel, and the 6 " paper plate below it.
  - Place 9" x 12" white constructions paper in the center of the work area.
  - Set open paint tray and place it between the paper towel holding the paintbrushes and water container and the white construction paper.



MODELING *(Presentation of new material, demonstration of the process, direct instruction)*

- Instruct students to fold their paper in half with the short sides of the rectangle together and write their names on the back of the paper.
- Demonstrate how and instruct students to practice the following **watercolor** techniques using the document camera:
  - Use a white crayon to make a small line or shape on each side of the construction paper.
  - **Wet on Wet:**
    - Cover one half of the construction paper with clean, clear water using the largest paintbrush. Place enough water on the paper to make is wet, but not soaked through to cause rips or holes. Place brush on folded paper towel.
    - Wet the medium sized brush and touch it to the blue **watercolor cake**. Repeat this two or three times moving clean water to the blue **watercolor cake**. Let the water sit

for a minute allowing the water to sink into the **cake** and make it soft and fluid.
    - Touch the medium sized brush unto the surface of the blue **watercolor cake** and fill it with paint.
    - Lightly touch the paintbrush to the wet side of the construction paper. Watch how the paint moves and spreads.
- *Ask:*
    - *"Why do you think the paint spreads out like that?"* [water on the paper acts a transportation system and moves the paint farther than expected]
    - *"What do you think will happen if we touch the paintbrush to the dry side of the construction paper?"* [paint will not move as far, but absorb into the paper]
        - Run the paintbrush over the area where the white crayon was used.
- *Ask:*
    - *"Why can we still see the white line after is was covered in paint?"* Crayon is made of wax and the paint will not stick to it]
    - *"What do we call it when we can see through something?"* [**transparent]**

    - Wet on Dry:
        - Fill the brush with blue paint again and lightly touch the brush to the dry side of the construction paper.
- *Ask:*
    - *"Why is it important to know that **watercolor** paint acts differently on wet paper than it does on dry?"* [an artist needs to know how paint will react so the paint will create the desired effect]
    - Light **Wash:**
        - A **wash** is used in **watercolor** to cover a large area of the surface with a particular color of paint. A **wash** is usually light in **intensity**.
        - Using the medium sized brush, transport blue **watercolor** paint to the paper **palette** (plate). This **palette** (plate) will be used for other colors later in the lesson, so place the blue paint toward one side.
        - Use more water on the blue **watercolor cake** as needed.
        - Add water to the paint on the **palette** (plate) making a puddle of light blue.
- *Ask:*
    - *"What happened to the color of the blue paint when we added more water?"* [color became less **intense** or lighter]
        - Use the light blue to cover a large area of the wet side of the paper using the medium brush and long, even strokes.
        - Reload the brush and repeat the motion on the dry side of the paper.
- *Ask:*
    - *"Which side of the paper was easiest to control? Why?"* [the dry side because the paint did not **blend** or move as much]
        - Experiment with the largest brush.
        - Add more paint to the paper plate using the largest brush and add more water too.
        - Load the brush with paint and cover a large area on the wet side of the paper using long, even strokes.
        - Repeat the process on the dry side of the paper.
        - Notice that the wet side of the paper is beginning to dry. The paint is not "moving" as much as it did when the paper was originally wetted.
- *Ask:*
    - *"Why is the **watercolor** paint not moving as much as it did when we first used the wet side of the construction paper?"* [it is beginning to dry and absorb into the paper]
    - **Blotting:**
        - Let a drop of paint fall on the dry side of the construction paper in an area where no paint has been placed.
        - Take the clean paper towel and gently pick up the paint.
        - Explain to the students that this technique is called **blotting.**

        - Let a drop of paint fall on the wet side of the construction paper in area where no paint has been placed.
        - Take a part of the paper towel that is clean and **blot** the spot.
- *Ask:*
    - *"How are the two areas where the paint dripped the same? Different?"* [depending on how fast the drop was removed, one could be more effective than the other]
    - **Blend** color:
        - Add more water to the surface of part of the wet side of the construction paper using the largest brush.
        - **Wash** in a layer of blue paint.
        - Add water to the yellow **watercolor cake**.
        - Fill the medium brush with yellow paint and place paint on the wet blue painted area.
        - Observe as the colors **blend** and create green.
        - Add some of the yellow paint to the puddle of blue paint on the paper plate and **blend or mix**.
        - Use the green paint that was created on the **palette** (plate) on the dry side using the construction paper.
    - Smallest brush:
        - Load the smallest paintbrush with **watercolor** paint.
        - Create straight and curved lines on the wet and dry sides of the paper.
    - **Value** and **Intensity**:
        - Discuss how more water creates lighter **transparent** colors and less water creates darker and more **intense** colors.
        - Allow students to create three **values** of green: dark, medium and light. They may use the green they created with blue and yellow on their **palette** and green from the green **watercolor cake** in the tray.
        - Allow students to create a yellow-green and a blue green.
- Instruct students to place this practice sheet to the side and use as a reference when completing the **botanical illustration** of the bean. This will be especially important for the use of many **values** of green needed to complete the work of art.

GUIDED PRACTICE *(Application of knowledge, problem solving, corrective feedback)*

- Display the **botanical illustration** of a bean (color version) in an area easily seen by all students. The image appears at the end of this lesson.
- Distribute the students' **botanical illustrations** from ITQ Arts and Science Integration Grade 3 Visual Art and Life Science, Lesson 2: *The Science of **Botanical Illustration***.
- Discuss how the techniques the students just practiced may be used to complete their **botanical illustrations**.
    - There is no white **watercolor** paint, so any area that is white, needs to be left untouched by paint or drawn with white crayon to keep the area white.
    - **Watercolor** paint looks darker when it is wet.
    - Begin by using light colored paints and **washes**.
    - Clean brushes completely before changing to a new color so that the **watercolor cakes** are not contaminated with other colors.
    - If a **cake** gets contaminated with another color, add lots of clear water with the paintbrush to dilute the unwanted color. Wipe the brush on the blotter paper towel to remove the unwanted color. Repeat this process until the cake is clean. Be careful not to gouge the **watercolor cakes** during this process.
    - Replace water as needed to keep color contamination at a minimum.
    - Less water creates more intense color.
    - As the paper and the **washes** dry, use more concentrated colors over the lighter layers being careful not to cover all the light spaces. (For some students this is like thinking backwards. Many students think and plan in solids, not **transparent** layers.)
    - Purple, brown and black are absolutely used last. If a student begins to use purple, brown or black then they are signaling that they have completed their **botanical**

illustration.
    - A **watercolor** painting lying flat should not drip or run. Picking up a paper to show the teacher or a friend can make a **watercolor** painting run and ruin the student's work.
    - When papers are transported to drying areas they should be carried flatly.
- Conference with students individually or in small groups as they complete the **botanical illustration**s in color.
- Instruct students in clean up procedures as appropriate.
    - Leave **watercolor** trays open until dry if space is available.
    - Clean **watercolor** brushes thoroughly. Clean all of one size at once under running water and place them on a clean paper towel to dry. Make sure all bristles are formed into a point to preserve their efficiency.

DEBRIEF & REFLECT *(Identify problems encountered, ask and answer questions, discuss solution and learning that took place. Did students meet outcomes?)*

- Allow students to verbally identify and describe the functions and structures of the bean plant.
- Science Notebook Prompt: "How does creating a **botanical illustration** help me learn about the structures of plants?"

EXTENSION *(Expectations created by the teacher that encourage students to participate in further research, make connections, and apply understanding and skills previously learned to personal experiences.)*

- Number each plant structure and create a key at the bottom of the botanical illustration naming the structures.
- Encourage students to draw and paint plants from their inside and outside home and neighborhood environment.
- As a class collect photographs of exotic fruiting plants from around the world.

http://redhousedesign.blogspot.com/2009/01/botanical-illustrations.html

CLASS-AT-A-GLANCE CHECKLIST
Lessons Two and Three

	Seed, sprouting seed, seedling, flowering plant, fruited plant and bean pod appear in botanical illustration.		Student identifies all plant structures correctly.		Student describes plant structure functions accurately using correct vocabulary.	
Student Name	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**
1.						
2.						
3.						
4.						
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