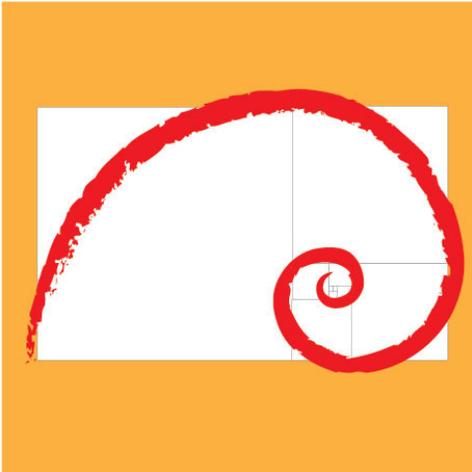




Discovery Lesson

TEACHER ENRICHMENT RESOURCE PACKET



Beautiful World: Science and Art

March 25 – August 31, 2013

Painting, sculpting, composing - what do these art forms have to do with science? Explore how science and math are involved in the methods and materials used by artists around the world. Get your creative juices flowing as you dance, draw, and weave your way through the connected worlds of science, math and the arts.

Think it.
Try it.
Explorit.

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Learning Objectives:

Learning objectives provide a broad overall guide to what students will begin to experience and understand through this TERP and through participation in Explorit's "Beautiful World" *Discovery Lesson*. During this *Discovery Lesson*, students will be exposed to the following ideas:

- Science and Art use similar methods for advancing each field.
- Science can be used by artists and art can inspire science.
- Advances are made through trial and error and begin with a question.

Welcome to Explorit Science Center

Thank you for choosing Explorit Science Center's *Discovery Lesson* program to supplement your ongoing science curriculum. Whether you use the program to kick off a new unit, wrap up a nearly completed unit, or purely to excite and interest your students in the wonderful world of science, advance preparation and follow up with your students are critical to achieving the greatest educational benefit from this unique science experience.

Explorit provides two resources to help prepare you and your students for the *Discovery Lesson*. First, simple logistics of the program are detailed in the confirmation letter. Second, this Teacher Enrichment Resource Packet outlines appropriate science content and processes to help you:

- successfully prepare your students prior to visiting Explorit;
- participate fully in the *Discovery Lesson* yourself; and
- follow-up with your students back in the classroom.

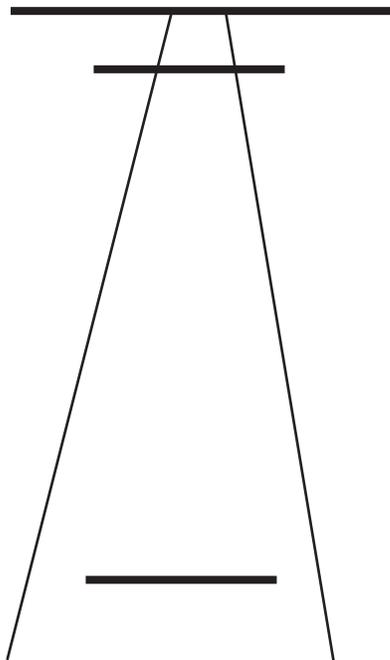
"Beautiful World: Science and Art" Background Information

The qualities that define art vary from person to person. What one person finds "beautiful," another might not. Art is subjective; it will be unique for each viewer, and therefore it is hard to define. Art can vary from spray painting on a street to paintings by Picasso. Science and art may seem like separate subjects but they both have a common root in curiosity. Creative people influence both science and art with new ideas based on established knowledge. Both require attempts, experiments, procedures and results before progress can occur. Scientists conduct research and experiments to discover information that they did not know. Scientists set up elaborate or simple apparatus to ensure that they gather the data that they need. They run several experiments to make sure that the results are reproducible and accurate. However this process is not solely used by scientists. All artists use a similar method when creating their piece. The process that an artist uses involves multiple attempts developing a technique. From the experimentation each artist discovers their own technique to create their piece.

Artists make use of scientific discoveries and properties. A sculptor needs to understand the properties of physics in order to make sure the piece is well balanced. If the material is outside it needs to have properties that can withstand sunlight, water, and wind. A tall sculpture will need to be firmly fixed to a heavy base to ensure it will not tip over. A potter needs to have a kiln that will hold the right temperature to create ceramics that will be sturdy. A kiln must be built to maintain the correct temperature for firing. The materials that are used must be able to withstand intense heat for long periods of time. A photographer needs to understand how light will affect the exposure, the focal length of the lens they are using, and how long the aperture will be open for.

Painters use various techniques when creating their pieces. By adding a horizontal line across a painting a "horizon" is established giving a sense of depth to the piece. It also indicates where "sky" and "ground" are located. Lines can then be added to simulate distance, for instance two lines approaching the horizon line add a sense of distance. How an object





is drawn in relation to these lines will give a sense of scale, how large an object is. The closer to the horizon the larger we perceive it to be, the farther away from the horizon the closer it can appear to be. These techniques were created as artists tried to simulate the world they saw as paintings. These artists studied the world around them. Each painting gives an artist more experience to draw upon and new techniques to attempt on their next piece. Observation, practice and information gathering are part of a circle that has been practiced throughout the ages and new techniques have been invented along the way. Pointillism is a technique that makes use of how our brain can interpret an image just with small dots. The properties of reflection can be used by artists dealing with reflective surfaces. Reflection and refraction need to be taken into account by jewelers cutting gems at the correct angles to create a sparkling effect as the gem is turned in the light.

Artists use properties that can be explained by science, however science can be influenced by art. Scientists have worked on formulating new inks for printing, new materials for sculpting and new techniques for painting. The goal any scientist has is an answer to a question. Accomplishing an answer means creating controlled experiments so the results can be repeated and a method obtained. The key is a curiosity that drives a person to ask questions, seek answers and try experiments. Without a question to guide scientists there would be no goal to work towards. Curiosity can result in questions being answered by creative solutions. This means that anyone can be a scientist since anyone can use the scientific method to solve problems and answer questions. Since all that is needed is a question, the question can be "What happens when I mix paint colors?" or "What is a better way to create paint?"

Anyone can be an artist and a scientist. All you need is a goal, time to practice, time to reflect and a question. What will you discover?

"Somewhere, something incredible is waiting to be known" ~ Carl Sagan.

Supplemental Resources

WEB SITES:

"Seeing in the Dark" Radiolab Podcast

[HTTP://WWW.RADIOLAB.ORG/BLOGS/RADIOLAB-BLOG/2012/OCT/22/SEEING-DARK/](http://www.radiolab.org/blogs/radiolab-blog/2012/oct/22/seeing-dark/)

"Colors" Radiolab Podcast

[HTTP://WWW.RADIOLAB.ORG/2012/MAY/21/](http://www.radiolab.org/2012/may/21/)

"GUTS" RADIOLAB PODCAST

[HTTP://WWW.RADIOLAB.ORG/2012/APR/02/](http://www.radiolab.org/2012/apr/02/)

"DESPERATELY SEEKING SYMMERY" RADIOLAB PODCAST

[HTTP://WWW.RADIOLAB.ORG/2011/APR/18/](http://www.radiolab.org/2011/apr/18/)

"PHOTOGRAPHY: A NEW ART OR YET ANOTHER SCIENTIFIC ACIEVEMENT"

[HTTP://WWW.SCRIBD.COM/DOC/123850/PHOTOGRAPHY-ART-OR-SCIENCE](http://www.scribd.com/doc/123850/PHOTOGRAPHY-ART-OR-SCIENCE)

"FROM STEM TO STEAM"

[HTTP://BLOGS.SCIENTIFICAMERICAN.COM/GUEST-BLOG/2012/08/22/FROM-STEM-TO-STEAM-SCIENCE-AND-THE-ARTS-GO-HAND-IN-HAND/](http://blogs.scientificamerican.com/guest-blog/2012/08/22/from-stem-to-steam-science-and-the-arts-go-hand-in-hand/)

"CONNECTING SCIENCE AND ART"

[HTTP://WWW.NPR.ORG/2011/04/08/135241869/CONNECTING-SCIENCE-AND-ART](http://www.npr.org/2011/04/08/135241869/connecting-science-and-art)



Classroom Activity #1

ACTIVITY #1 - Chemical Tie-Dye

Background: Pigments and inks are created by combining different dyes together to achieve the desired color. Sharpie permanent markers use ink that does not dissolve in water; however the dyes that create the colors are soluble to isopropyl alcohol. When the alcohol interacts with the ink it will separate the colors that make up the ink. Smaller molecules of ink will travel farther away. This activity will look at the dyes that make up sharpie ink while creating a tie-dye effect.

Objective: Students will discover how different colors can be mixed to produce new colors.

Materials:

Sharpies of various colors

100% cotton cloth (mixtures will not work well)

Isopropyl Alcohol any percentage will work

Eye-droppers or pipettes

Warning: Do not let students touch isopropyl alcohol and their face!

1. Choose a Sharpie color and draw a dot on your cotton.
2. Use the eye-dropper to place a few drops of alcohol in the center of the sharpie dot.
3. Watch as the colors spread out.
4. Repeat with different colors or clusters of dots.

Follow up: What colors make up the sharpie color? Colors can be created from combining several different colors together. How would you create new colors? How could you create a face using the method of tie-dye? What would you need to do to create an animal?



Classroom Activity #2

ACTIVITY #2 - Hand Pipes

Background: Sound is created by vibrations in the air. The length of the object vibrating determines the wavelength. By hitting pvc pipe cut at different lengths with the palm of your hand, different sounds can be produced. The thickness of the pipe also influences the quality of the sound produced. If students do not share the pvc pipes, they could blow air across the pipe to create sustained sound.

Objective: Students will discover that length will affect how an instrument will sound.

Materials:

PVC pipe to be cut down in size

PVC pipe cutter

Permanent marker

1. Give students a standard size of pipe that you choose. Allow students to experiment in making sound come out of them. If students are allowed to blow air through them, use rubbing alcohol to disinfect them.
2. Allow students to determine the length of the 2nd tube and cut out the pipe for them and allow them to experiment with it.
3. Alternatively you could provide them with plastic spoons, spatulas or rulers to see how they affect the quality of sound.

Follow up: Can students create a chromatic scale of notes? How does the material influence sound? What objects at home can produce sound? Are there any patterns that they can see from experimentation?



Science Standards for Beautiful World: Science and Art

CA STANDARDS

Kindergarten: 4a, 4c, 4d, 4e

1st: 4a, 4d

2nd: 1a, 1g, 4a, 4d, 4f

3rd: 2c, 5a, 5b, 5c, 5d

4th: 5c, 6d, 6f

5th: 6b, 6d, 6f, 6h

6th: 2b, 7a, 7e

Explorit Programs for Schools and Groups

At Explorit's Sites

Discovery Lessons & Inquiry Labs **Nature Safaris**

Visit one or more of the Changing Exhibitions throughout the year
Spring visits to Explorit's outdoor spaces at Mace Ranch Park

Explorit in Your Classroom

Classroom Adventures Science Investigations for Grades K-6

For the Whole School

Health in Your World **Science in Your World**

Learn about keeping your body and the world healthy and safe
The ultimate family science night

Reservations required.

**For information please call
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