
Exploring
Light & Color

EXPLORING LIGHT & COLOR

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EXPLORING LIGHT & COLOR

COURSE PURPOSE

The primary purpose of the course "Exploring Light & Color" is to develop a correlation of both the scientific and the artistic aspects of light and color. The light from the Sun, the luminescence of an electric light bulb or the glow of a fire, all originates in the scientific discoveries of astronomy, physics, electromagnetism, and human physiology. Color, the spectrum of light that one perceives envelops our world in every aspect of conscious reality. From the red stoplight at the corner indicating danger, to the artistic blending of paint on a canvas to emote an emotion, color is everywhere. The course includes important knowledge, attitudes, and skills which students should develop and learn through various activities, some of which are visual, some auditory, and some kinesthetic activities.

The course is specifically designed to stimulate discovery. An underlying purpose and value which should be strived for within its presentation and implementation are to steer the student's attitude toward an appreciation of Art of Science and the Science of Art. Developing reflection and appreciation of the relationship is paramount. The development of exploratory skills through the directed online inquiry combined with practical application of color theory via physical color mixing leads the student to a comprehensive understanding of the physical world of light and color.

Image 1

COURSE OBJECTIVES

The general objective of "Exploring Light & Color" is to educate the student in the relationships between the physical world that one inhabits and how the understanding of astronomy, physics, mathematics, and the anatomy of light can be applied and manipulated through the elements and principles of artistic expression via color to create Art. Students who undertake the twelve expeditions of discovery will receive benefit from the discovery and reach the following goals:

The purpose and intent of the instruction are obtainable and realistic in terms of student's ability and the time allotted for each through the 12 "Expeditions." The exploratory lessons are designed to direct the student on a methodical pathway with each expedition building on the last. The time frame for each is designed to introduce the most material in the shortest timeframe, yet creating mechanisms within the timeframe to instantiate learning.

Students who undertake the twelve expeditions will receive benefit from the discovery and reach the following goals:

- Appreciation of the astrological origins of light.
- Understand the mechanisms and physiology of the human eye.
- Comprehend the relationship between light and color respectively.
- Recognize the differences between paint, ink and digital colors.
- Identify the components of the color wheel.
- Be able to converse with the vocabulary of color and light.
- Apply techniques of mixing primary colors to achieve secondary colors.
- Create Art with the application of created palette.

Light surrounds us, both day and night. Like oxygen is essential to breathe, light is necessary to see. Seeing is one of our five senses. This unit of instruction is composed of 12 Expeditions or Learning modules.

Exploring Color & Light contains multiple activities and engagements with the material for group Discovery Projects expeditions and for independent investigations. Each consists of approximately 35 - 45 minutes of course activity. Each of the Expeditions activities corresponds to the 12 colors in the spectrum of light: 3 Primary, 3 Secondary, and 6 Tertiary colors. Learning environment requirements for the successful application of the audio-visual presentations and Internet access for both the facilitator and the learner is recommended to access the instructional material and maintain the engagement of the participant.

COURSE PARAMETERS

- Title: Exploring Light & Color

- Objectives: The objective of "Exploring Light & Color" is to develop each of the three domains of the learning pedagogy, e.g., Cognitive, affective and psychomotor. The first of which will focus on the development of intellectual skills and knowledge development demonstrated through discovery expeditions. The development of group interactions directed toward knowledge exchange and sharing. Upon completion of each Expedition, an evaluation of knowledge retention via question and answers forum.

- Length: Twelve lessons referred herein as "Expeditions" with an instructional time of 35 to 45 minutes each, collectively comprising approximately 7 to 10 hours of instructional delivery. Some time allotments will be longer, some shorter affording flexibility of delivery.

- Trainer /Trainee prerequisites: The instructor, teacher, trainer or facilitator hereafter referred to as the Expedition Guide, should be proficient, well versed, and practiced in the subject matter beyond the scope of the lessons provided. The Guide should have a level of understanding of astronomy, physics, anatomy, and artistic expression. Certification is not required. Those proficient in the sciences with knowledge of Art or an Artist with an understanding of science will meet the prerequisites for effective delivery. Skills in the principles of delivery and learning will override and compensate for deficiencies in either body of knowledge.

  The trainee, student, learner, or participant shall hereafter be referred to in this document as the Explorer. There is no prerequisite for the Explorer. The Explorer can be of any age between 12 to adult in age. However, the optimal target group and design focus of this course lean toward the younger elementary student where exploration and discovery lend itself to a fun and exciting exercise of new and exciting material.

- Room arrangement: The room can be arranged in any appropriate fashion to suit the student and instructional needs of both. However, an appreciation for the contents of the lesson expeditions may dictate the variable arrangement of the room furniture to facilitate the use of Discovery Projection, computers, and the real application and implementation of paint and solvent.
- See section MATERIALS FOR EACH EXPEDITION

- Instructor Check List

  - Supplies:
    - Printing Paper
    - Poster Board (White & Black)
    - Scissors
    - Markers
    - Canvas Paper or Boards 9" x 12."

- Paper Plates
- Plastic Cups
- Paper Towels
- Paint Brushes
- Acrylic Paint (Red, Yellow, Blue, Black, White)
- Candle
- Lighter or Matches
- Straight Pins
- Sheet plastic or inexpensive plasticized table cloths for each work area

- Equipment:
  - Flashlight
  - Light Meter
  - Prisms
  - Thermometer
  - Printer
  - Overhead Discovery Projector
  - Computers with Internet Connection
  - Pantone Swatch Book
  - Whiteboard
  - Desks, Tables & Chairs

- Room Requirements: The room requires a window or exit with access to natural sunlight. The seating arrangement should be set up to facilitate the formation of small groups dependent on the density of the participants. Visual access to the whiteboard and overhead Discovery Projection of presentation material is required. Computer equipment is needed on each desktop, preferably on a one to one basis with a learner or shared. Access to tabletop areas for painting activities should be covered with protective plastic. Considerations for easy cleanup of wastewater from painting activities should be considered.

- Hand-Outs:
  - Color hand out of all Expeditions 1-12
  - Color Prints of Famous works of Art

- Visual Aids:
  - Wall posters of the Sun
  - Wall poster of Isaac Newton
  - Wall poster of the RYB color wheel

COURSE OUTLINE

1. Expedition 1: Red ~ The Sun
   A. Trainer Presentation with PowerPoint Presentation 1
   B. Learning Activities - Discovery Expedition 1
   C. Evaluation – Question, Answers, Group discussion

2. Expedition 2: Red- Violet ~ Sources of Light

   A. Trainer Presentation with PowerPoint Presentation 2
   B. Learning Activities - Discovery Expedition 2
   C. Evaluation – Question, Answers, Group discussion

3. Expedition 3: Violet ~ The Eye

   A. Trainer Presentation with PowerPoint Presentation 3
   B. Learning Activities - Discovery Expedition 3
   C. Evaluation – Question, Answers, Group discussion

4. Expedition 4: Blue-Violet ~ The Components of Light

   A. Trainer Presentation with PowerPoint Presentation 4
   B. Learning Activities - Discovery Expedition 4
   C. Evaluation – Question, Answers, Group discussion

5. Expedition 5: Blue ~ Color Blindness

   A. Trainer Presentation with PowerPoint Presentation 5
   B. Learning Activities - Discovery Expedition 5
   C. Evaluation – Question, Answers, Group discussion

6. Expedition 6: Blue -Green ~ Black & White

   A. Trainer Presentation with PowerPoint Presentation 6
   B. Learning Activities - Discovery Expedition 6
   C. Evaluation – Question, Answers, Group discussion

7. Expedition 7: Green ~ Gamut

   A. Trainer Presentation with PowerPoint Presentation 7
   B. Learning Activities - Discovery Expedition 7
   C. Evaluation – Question, Answers, Group discussion

8. Expedition 8: Yellow -Green ~ Digital Colors

   A. Trainer Presentation with PowerPoint Presentation 8
   B. Learning Activities - Discovery Expedition 8

C. Evaluation – Question, Answers, Group discussion

9. Expedition 9: Yellow ~ Ink & Dye Colors

   A. Trainer Presentation with PowerPoint Presentation 9
   B. Learning Activities - Discovery Expedition 9
   C. Evaluation – Question, Answers, Group discussion

10. Expedition 10: Yellow - Orange ~ Paint Colors

   A. Trainer Presentation with PowerPoint Presentation 10
   B. Learning Activities - Discovery Expedition 10
   C. Evaluation – Question, Answers, Group discussion

11. Expedition 11: Orange ~ Color Relationships

   A. Trainer Presentation with PowerPoint Presentation 11
   B. Learning Activities - Discovery Expedition 11
   C. Evaluation – Question, Answers, Group discussion

12. Expedition 12: Red - Orange ~ Color Terms

   A. Trainer Presentation with PowerPoint Presentation 12
   B. Learning Activities - Discovery Expedition 12
   C. Evaluation – Question, Answers, Group discussion

MATERIALS FOR EACH EXPEDITION

Every Explorer requires resources to accomplish the journey with success. Gathering the appropriate supplies, tools, materials, and provisions for your Expedition are listed below.

EXPEDITION 1: RED ~ THE SUN

- 2 pieces of stiff white cardboard, e.g., 2 paper plates
- alternatively, 2 sheets of plain white paper
- a thumbtack, a sharp pin, or a needle

EXPEDITION 2: RED-VIOLET ~ SOURCES OF LIGHT

- A Light Meter
- A candle
- Matches or Lighter
- A dark room

EXPEDITION 3: VIOLET ~ THE EYE

- Printed Handout for each Explorer "How the Eyes Work

EXPEDITION 4: BLUE-VIOLET ~ COMPONENTS OF LIGHT

- glass prism
- strong sunlight
- white cardboard / paper (optional)
-

EXPEDITION 5: BLUE ~ COLOR BLINDNESS

- Color Blindness chart supplied within the Discovery Project. – Print out for each student

EXPEDITION 6: BLUE-GREEN ~ BLACK & WHITE

- Black construction paper cut into equally sized squares for each Explorer
- White construction paper cut into similarly sized squares for each Explorer
- A thermal sensing device as simple as a mercury bulb thermometer, a cooking thermometer, or a laser thermometer.

EXPEDITION 7: GREEN ~ GAMUT

- A flashlight with a blue lens
- A flashlight with a red lens
- A flashlight with a green lens

EXPEDITION 8: YELLOW-GREEN ~ DIGITAL COLOR

- Connection to the Internet
- Computer with monitor

EXPEDITION 9: YELLOW ~ INK COLORS

- A Pantone Color Swatch book
- A colored print such as great master painting, for example, Monet.

EXPEDITION 10: YELLOW-ORANGE ~ PAINT COLORS

- 2 tubes of Yellow acrylic paint
- 1 tube of Red acrylic paint
- 1 tube of Blue acrylic paint
- A brush for each explorer
- A paper plate for each explorer
- A plastic cup of water for each Explorer
- A few rolls of paper towels for the whole Expedition
- A pencil for each explorer
- Water

EXPEDITION 11: ORANGE ~ COLOR RELATIONSHIPS

- 2 tubes of Yellow acrylic paint
- 1 tube of Red acrylic paint
- 1 tube of Blue acrylic paint
- A brush for each explorer
- A paper plate for each explorer
- A plastic cup of water for each Explorer
- A few rolls of paper towels 9 x 12 Canvas paper, board, or stretched
- Water

EXPEDITION 12: RED-ORANGE~ COLOR TERMS

- 1 tube of White acrylic paint
- 1 tube of Black acrylic paint
- 2 tubes of Yellow acrylic paint
- 1 tube of Red acrylic paint
- 1 tube of Blue acrylic paint
- A brush for each Explorer
- A paper plate for each Explorer
- A plastic cup of water for each Explorer
- A few rolls of paper towels
- 9 x 12 Canvas paper, board, or stretched
- Water

THE EXPEDITIONS

EXPEDITION 1: RED ~ THE SUN

The instructor will guide the student singularly and as a group in the search for knowledge about the Sun. At the end of this Expedition, the student will understand that the sun is a star. The student will know how far from Earth it is located and how long it takes for light to travel to Earth. The student will know the speed of light and learn the temperature of the Sun. They will understand the physical constructs of the Sun. The student will know what a sunspot consists of and how it can affect Earth. The student will appreciate the relationship of Earth to the Sun and how it affects life on Earth. After the expedition, the student will be evaluated by oral questioning.

EXPEDITION 2: RED-VIOLET ~ SOURCES OF LIGHT

Upon completion of the Expedition, the Explorers will be able to understand the history of light. The Explorers will be able to demonstrate and explain why a prism breaks light into its spectral parts like a natural rainbow. The knowledge, skill, and attitude acquired will excite the senses and prompt questions and discovery. The Explorers will be debriefed with questions and encouraged to create questions concerning Light,

EXPEDITION 3: VIOLET ~ THE EYE

After this Expedition, the Explorer will be able to identify the parts and the function of the human eye. During the Discovery Project, the Explorer will label and determine the role of the human eye and how light enters the eye. After the Expedition, the Explorer will be reexamined with another eyeball cross-section graphic to test for retention.

EXPEDITION 4: BLUE-VIOLET ~ THE COMPONENTS OF LIGHT

In this Expedition, the Explorers will investigate various aspects of light, both natural and artificial. They will discover that light has many properties with varying dimensions of intensity, color, temperature, and reflectivity. The guidance by the instructor will direct the student to areas of video and text on the Internet, and the Discovery Project will contribute to their inquiry with the demonstration of a light meter, how it relates to the variety of types of light. After the Expedition, the learner will partake in a verbal questioning of the students and asking the students to compile a question that can be asked to foster dialogue.

EXPEDITION 5: BLUE ~ COLOR BLINDNESS

The human eye is a product of genetics. Sometimes people can get a genetic abnormality which causes the eye to misinterpret colors. This condition is known as color blindness. In this Expedition, the Explorer will be exposed to the standard color blindness test. Learning will occur which the administration of the test. At the conclusion, the student will know that they are not color blind. Should an Explorer be determined color blind, they will be referred to additional professionals.

EXPEDITION 6: BLUE-GREEN ~ BLACK & WHITE

The subtle nuances of light can be demonstratively enhanced with an understanding of White and Black, not only as a defined color but an example of basic comprehension of the composition of light itself. As white is the reflection of all colors and black is the absorption of all colors, the Discovery Project presented in this Expedition reveals light as energy. The energy that when absorbed produces heat. Learning occurs when the Explorer recognizes that a process has occurred, albeit invisible to the eye other than recognition of a white substance and a black substance that something has happened. After the Discovery Project and with the assessment of the student understanding, a determination can be ascertained as the Explorers comprehension of light, both as a source of color but also energy.

EXPEDITION 7: GREEN ~ GAMUT

Color is a perceptual phenomenon, and as such the mechanism of color delivery, be it by paint, ink or in a digital representation must be understood to begin an understanding the various ways color is reproduced. The entire range of colors available on a particular device such as a monitor or printer is known as a color gamut of that device. A monitor, which displays RGB signals, typically has a higher color gamut than a printer, which uses CMYK inks. In this Expedition, the Explorer will investigate both the additive and subtractive qualities and properties of the digital color, paint color, and printing ink color gamut. The Discovery Project will demonstrate the additive qualities of red, green and blue light. Learning will occur throughout the PowerPoint presentation and the implementation of the Discovery Project, concluding at the end with a quiz to test for comprehension.

EXPEDITION 8: YELLOW-GREEN ~ DIGITAL COLORS

Expedition 7 introduced the Explorer to the concept of the color gamut. Expedition 8 expands on the idea with an in-depth discussion of Red, Green and Blue, RGB color gamut. The Explorer is introduced to color as a binary construct and the mathematics, terms, and definitions of the bit, byte and an exponential doubling of the bit. The Expedition Discovery Project affords the Explorer the ability to manipulate the three colors digitally through the online website. Learning occurs throughout the process and solidified by the Discovery questions at the end of the power point presentation. The Explorer will have an elemental understanding of the manipulation of digital color via applications such as Photoshop, Paint, and other binary RGB experiences.

EXPEDITION 9: YELLOW ~ INK COLORS

At the end of this Expedition, the Explorer shall be able to describe the four colors of CYMK and how these subtractive colors are used in various forms of printing, both personal and commercial. They will have acquired the knowledge necessary to identify print colors from a Pantone™ Color book, be able to understand ink colors used in personal at home printing and have the skills required to appreciate the relationship between RGB color gamut and CYMK color gamut. At the end of the Expedition, the Explorer will be given an opportunity to recall what has been discovered by an oral question and answer inquiry conducted for the Guide, e.g., the instructor, teacher, or facilitator.

EXPEDITION 10: YELLOW-ORANGE ~ PAINT COLORS

The RYB color gamut has been the mainstay of Artist for thousands of years, long before printing and digital ever was a thought. The value of understanding the RYB color wheel and its relationships to its surrounding colors makes up the focus of this Expedition. The Explorer upon completion of the Expedition will be able to mix the primary colors Red, Yellow and Blue to make the secondary colors of Violet, Green, and Orange. The Explorer will discover the mystery of subtractive colors and the enjoyment of mixing colors, which has fascinated painters, chemist, and even psychologist. The Explorer will be able to demonstrate the knowledge with the completion of the Discovery Project and through an oral question and answer session after the Expedition.

EXPEDITION 11: ORANGE ~COLOR RELATIONSHIPS

Now that the Explorer has completed Discovery Expedition 10, Expedition 11 builds upon the knowledge and skills learned and applies the newly acquired skills to a less structured, palette of the RYB primaries. The Explorer is introduced to the relationships between the colors that they have been able to mix. Learning will occur and be reinforced by the continuation of the color mixing Discovery Project. They will continue to apply the mixing of color as if on a palette rather than the creation of a color wheel and use the mixed colors in an artistic way of their own expression. After the Exploration, the Explorer will be tested for an understanding of the principles of complementary color through a question and answer session.

EXPEDITION 12: RED-ORANGE ~ COLOR TERMS

The final Expedition introduces the concept of value, saturation, hue, and other terms pertinent to the discussion of color. Upon the completion of the Expedition, the Explore will understand the terms and concepts aforementioned. The knowledge, skills, and attitudes acquired in this final Expedition will bring full circle the concepts of lights origins, colors place in visual perception, and the various applications in digital, printing and artistic use. Upon completion of the Discovery Project, the student will understand the practical application of white to create a tint, and how complementary colors are combined to produce grey. A multiple-choice quiz will be given at the end of the final Expedition.

Expedition 1: Red — The Sun

EXPEDITION

Upon the completion of Expedition Red, the student will be familiar with the astronomical location and physical properties of the Sun and its relationship to Earth. The student will be able to construct a pinhole Discovery Projector to safely view the Sun. The Explorer will understand the mechanisms of an eclipse which will demonstrate the relationship of the Earth, Moon, and Sun in our solar system. The student will acquire the knowledge, skills, and attitude necessary to have a cursory understanding of the Sun, its relationship to Earth and mankind, and the processes and physical properties required for the creation of light. The class will participate in a short question and answer session after the Discovery Project to build excitement and test for comprehension and instructional effectiveness.

EXPEDITION OUTLINE

Objective: This first Expedition 1: Red ~ The Sun, begins the journey of discovery for the Explorer. The purpose of this exploration is to expose the Explorer to the wonders of our solar system and instill an appreciation of where Earth's light comes from and how the Sun's incredible prominence is directly influential in the evolution of visual perception and color. Because the subject material is so vast, attention should be directed to time management within the constraints of one hour.

Methods: Initial instruction begins with lecture following the direction presented in a PowerPoint slide presentation, which follows three design points: Lecture and discussion, The Discovery Project for hands-on implementation of concepts, and Discovery Assessment to evaluate learning.

Media: Slide presentation, Discovery Project Sheets, Materials required for Discovery Project. Video can be utilized within or outside the prescribed curriculum. However, the considerations to the time involved may lend itself to extracurricular viewing.

EXPEDITION RESOURCES

VIDEO

WEBSITES

The National Solar Observatory (NSO) is the national center for ground-based solar physics in the United States (www.nso.edu) and is operated by the Association of Universities for Research in Astronomy (AURA) under a cooperative agreement with the National Science Foundation Division of Astronomical Sciences.

National Solar Observatory

POWERPOINTS

ASSESSMENT

1. How old is the Sun?
2. How many stars are there in the Universe?
3. How hot can the sun get?
4. What is a Sun Spot?
5. Why is the sun so hot?
6. How far is the Sun from the Earth?

NOTES

DISCOVERY PROJECT: DIY SIMPLE CARD DISCOVERY PROJECTOR

Never look at the Sun directly without protective eye gear. Even sunglasses cannot protect your eyes from the damage the Sun's rays can do to them.
Always keep your back towards the Sun while looking at a pinhole Discovery Projection.
Do not look at the Sun through the pinhole, binoculars or telescope.

WARNING

The simplest and quickest way to safely Discovery Project the Sun is with a Discovery Projector made from only 2 pieces of card or paper.

You Need:

- 2 pieces of stiff white cardboard, e.g., 2 paper plates
- alternatively, 2 sheets of plain white paper
- a thumbtack, a sharp pin, or a needle

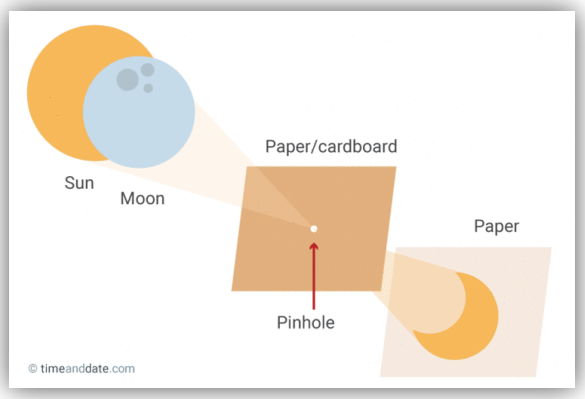


Image 2

THE CONCEPT OF A PINHOLE DISCOVERY PROJECTOR

What to Do:

1.) To make a quick version of the pinhole Discovery Projector, take a sheet of paper and make a tiny hole in the middle of it using a pin or a thumbtack. Make sure that the hole is round and smooth.

2.) With your back towards the Sun, hold 1 piece of paper above your shoulder allowing the Sun to shine on the paper.

3.) The 2nd sheet of paper will act as a screen. Hold it at a distance, and you will see an inverted image of the Sun Discovery Projected on the paper screen through the pinhole.

4.) To make the image of the Sun larger, hold the screen paper further away from the paper with the pinhole.

5.) A box Discovery Projector works on the same principles, it requires a little more time and a few extra items to construct, but it is sturdier.

Expedition 2: Red-Violet Sources of Light

EXPEDITION

At the end of this Expedition, the Explorer will be able to identify sources of light and understand light's properties. The Explorer will know what a light meter is and what it is used for in relation to various light conditions. The Explorer will exhibit the knowledge, skills, and attitudes necessary to identify various qualities of light, both natural and artificial and from what direction it is coming from. After the Expedition, the Explorers will be debriefed with a question and answer summary of the key points in the Discovery and will be asked to develop an important question of their own for presentation to the other Explorers.

EXPEDITION OUTLINE

Objective: Expedition 2: Red-Violet ~ Sources of Light, continues the journey of discovery for the Explorer. The purpose of this exploration is to expose the Explorer to the many sources of light beyond the natural light of the Sun and on to other sources of light. The objective is to generate an understanding that light can come from many sources. In this Expedition, a light meter will be used to demonstrate the various intensities of both natural and artificial light, in this Discovery Project a candle. Students will compile a list of all the possible sources of light and collectively compile a list to share. The time required for this Exploration should lend itself to approximately 30 minutes.

Methods: Initial instruction begins with lecture following the direction presented in a PowerPoint slide presentation, which follows three design points: Lecture and discussion, The Discovery Project for hands-on implementation of concepts, and Discovery Assessment to evaluate learning.

Media: Slide presentation, Discovery Project Sheets, Materials required for Discovery Project. Video can be utilized within or outside the prescribed curriculum. However, the considerations to the time involved may lend itself to extracurricular viewing.

EXPEDITION RESOURCES

VIDEO

WEBSITES

POWERPOINTS

ASSESSMENT

- How many different types of light sources can you list?
- What is a Light Meter?
- What are Kelvin scales for light?
- Why does a candle give off the light?
- What is an incandescent light bulb?

NOTES

DISCOVERY PROJECT: KINDS OF LIGHT

The Sun is natural light as discovered in the last Expedition. Now the explorers will investigate the intensity of light, both natural and artificial.

You need:

- A Light Meter
- A candle
- Matches or Lighter
- A dark room

DEMONSTRATION:

Image 3

Video 1

1.) Have explorers go to the Internet to search for How to Use a Light Meter
2.) List all sources of light that they can collectively compile into a list

Instructor: Take the light meter and demonstrate how it is used to measure light outside and inside the classroom. Allowing a few volunteers to give it a try.

Take readings and record the results in the chart:

Outside	
Outside shadow	
Inside Dark Room	
Inside with lighter flame	
Inside with candle burning	
Inside by sunlit window	
Inside with all lights on	

Expedition 3: Violet — The Eye

EXPEDITION

After the Violet Expedition is completed, the Explorer will understand and appreciated the working of the human eye. The Explorer will be able to identify the components structures and functions of the human eye. The Explorer will be able to demonstrate the relationship between light and how it is interpreted by the human eye structures of the retina, the optic nerve and how one perceives color from light via the rods and cones of the retina. Upon completion of the Exploration, the Explorers will be given an oral examination with questions and answers encouraging discourse and conversation between participants.

EXPEDITION OUTLINE

Objective: Expedition 3: Violet ~ The Eye, directs the Expedition of discovery forward to the knowledge base of the human eye and its anatomy. The purpose of this exploration is to describe the internal working of the eye and how light processes, perceived and sent to the brain for interpretation. The Explorer through the Discovery Project will identify the numbered components of the eye, adding these terms and their definitions to their vocabulary. Combined with the lecture and video, the Explorer will understand the relationship between the mechanisms of sight and Light, both natural and artificial. The time required for this Exploration should lend itself to approximately 30 minutes.

Methods: Initial instruction begins with lecture following the direction presented in a PowerPoint slide presentation, which follows three design points: Lecture and discussion, The Discovery Project for hands-on implementation of concepts, and Discovery Assessment to evaluate learning.

Media: Slide presentation, Discovery Project Sheets, Materials required for Discovery Project. Video can be utilized within or outside the prescribed curriculum. However, the considerations to the time involved may lend itself to extracurricular viewing.

EXPEDITION RESOURCES

VIDEO

WEBSITES

POWERPOINTS

ASSESSMENT

1. Do all animals have eyes?
2. Why are people's eyes different colors?
3. How many eyes does a fly have?
4. Why do we see colors?
5. What connects the eyes to the Brain?
6. What are some diseases of the eye?

NOTES

DISCOVERY PROJECT: HOW THE EYES WORK

Below is a drawing of the eye with some important parts numbered. Write the names of the components of the eye and their functions in the proper boxes. The clue list is there to help you.

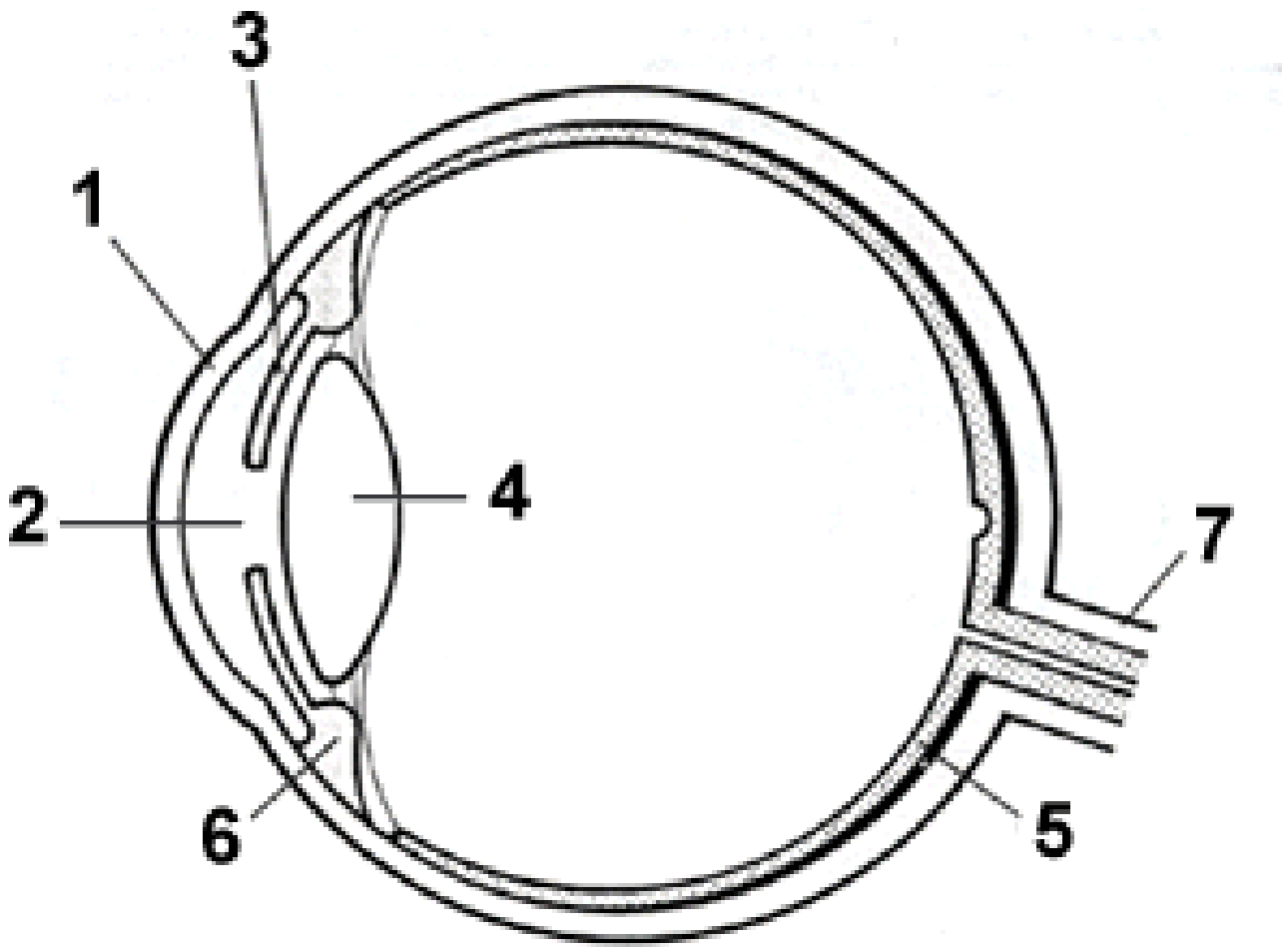


Image 4

Table 1

Number	Part Name	Function
1	Lens	Contains cells that detect Light
2	Retina	Opening to the inner eye
3	Ciliary Muscle	Controls the size of the pupil
4	Optic Nerve	Focuses image of the object
5	Pupil	Controls shape of the Lens
6	Cornea	Transmits information to the brain
7	Iris	An outermost transparent layer of the eye begins focusing process

ANSWERS:

1. Cornea. An outermost transparent layer of the eye. Begins focusing process.
2. Pupil. Opening to the inner eye.
3. Iris. Controls size of the pupil.
4. Lens. Focuses image of the object (on the retina).
5. Retina. Contains cells that detect light.
6. Ciliary muscle. Controls shape of the eye.
7. Optic Nerve. Transmits information to the brain.

Expedition 4: Blue-Violet — Components of Light

EXPEDITION

Upon the conclusion of the Blue-Violet Expedition, the Explorer will understand that light is composed of a spectrum of colors as demonstrated with a prism and also understand the mechanism of light refraction through raindrops to create a rainbow. The Explorer will participate in the Discovery Project and shall be able to produce a color spectrum with the prism. The Explorer will obtain the requisite knowledge that white light is a composite of electromagnetic waves made of photons. Additionally, within this discussion, the aspects and constructs of a Rainbow are introduced. The Explore will be evaluated after the Discovery Project with a group question and answer summary of material testing of retention of knowledge and skills obtained in the Expedition.

EXPEDITION OUTLINE

Objective: Expedition 4: Blue-Violet ~ Components of Light, explores the electromagnetic spectrum and lights placement in that spectrum. Expedition 4 address the physics of light as a wave and a particle, and through the Discovery Project, the light will be broken down into its component waveforms, much as Scientist Sir Isaac Newton discovered its properties. Expedition 4 should be presented and brought to a conclusion in approximately 30 to 40 minutes.

Methods: Initial instruction begins with lecture following the direction presented in a PowerPoint slide presentation, which follows three design points: Lecture and discussion, The Discovery Project for hands-on implementation of concepts, and Discovery Assessment to evaluate learning.

Media: Slide presentation, Discovery Project Sheets, Materials required for Discovery Project. Video can be utilized within or outside the prescribed curriculum. However, the considerations to the time involved may lend itself to extracurricular viewing.

EXPEDITION RESOURCES

VIDEO

WEBSITES

POWERPOINTS

ASSESSMENT

1. Where does light come from?
2. What is Light composed of?
3. Is Light energy?
4. Who discovered Light?
5. What is a Photon?
6. What is a Light particle?
7. What is a Rainbow?

NOTES

DISCOVERY PROJECT: CREATING A RAINBOW WITH A PRISM

You Need:

- glass prism
- strong sunlight
- white cardboard / paper (optional)

THE CONCEPT OF A PRISM

What to Do:

1.) Place a piece of white paper on the ground under the sunlight.

2.) Put the prism on or above the paper.

3.) Rotate and move the prism around until you see rainbow colors on the paper.

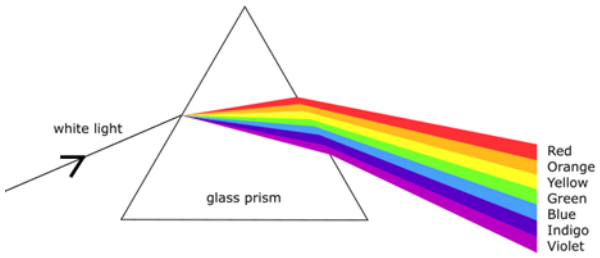


Image 5

Image 6

EXPEDITION

At the end of Expedition Blue, the Explore will understand the genetic mechanisms involved in the congenital condition known as color blindness. Upon completion of the colorblindness test in the Discovery Project, the Explorer will evaluate their visual color capabilities. The Explorer will be able to explain how colorblindness is tested and its impact on in the determination of color recognition. Upon conclusion of the Discovery Project, the Explorers will be evaluated for an understanding of the concepts with a question and answer assessment directed to encourage discussion and idea sharing among Explorers.

EXPEDITION OUTLINE

Objective: The objective of Expedition5: Blue- ~ Color Blindness, is to explore the genetic challenge of color blindness. This module is included to demonstrate that color as the human eye perceives it can be erroneous and is interruptive. Because a percentage of men and to a lesser degree woman is afflicted with color blindness, the cursory and non-clinical discussion of the causes and ramifications of color blindness are important to the Explorer in assessing color. The Discovery Project is presented only as entertainment and not meant to represent any clinical assessment. As noted, should an Explorer not be able to read the numbers, consultation with the appropriate responsible parties should be undertaken. This Expedition should require no more than approximately 25-35 minutes to complete.

Methods: Initial instruction begins with lecture following the direction presented in a PowerPoint slide presentation, which follows three design points: Lecture and discussion, The Discovery Project for hands-on implementation of concepts, and Discovery Assessment to evaluate learning.

Media: Slide presentation, Discovery Project Sheets, Materials required for Discovery Project. Video can be utilized within or outside the prescribed curriculum. However, the considerations to the time involved may lend itself to extracurricular viewing.

EXPEDITION RESOURCES

VIDEO

WEBSITES

POWERPOINTS

ASSESSMENT

1. What is color blindness?
2. How many people are affected in the world?
3. Do only men get color blindness?
4. Is color blindness genetic and hereditary?
5. Is there a cure for color blindness?
6. What types of color blindness are there?

NOTES

DISCOVERY PROJECT: COLOR BLINDNESS TEST

Color blindness is not a form of blindness at all, but a deficiency in the way you see color. With this vision problem, you have difficulty distinguishing certain colors, such as blue and yellow or red and green. Color blindness affects about 1 in 10 men throughout the world in varying degrees, women a bit less.

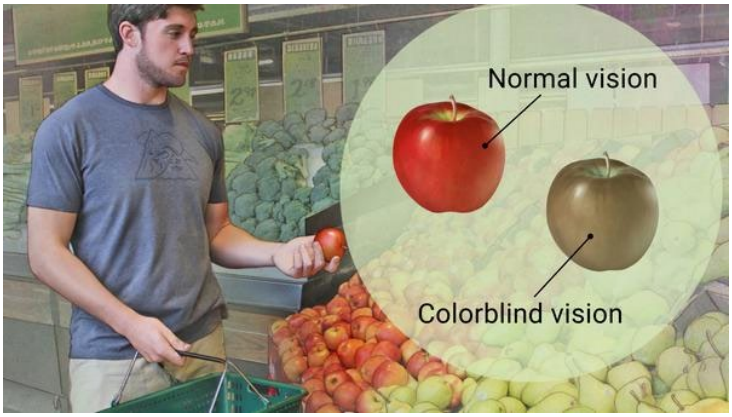
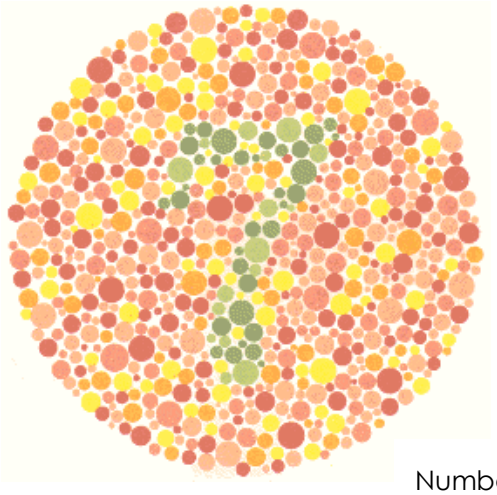


Image 7

- More than **3 million** US cases per year
- Treatment can help, but this condition can't be cured
- Usually self-diagnosable
- Lab tests or imaging not required
- Chronic: can last for years or be lifelong
- The condition is often inherited. Other causes include certain eye diseases and medications. More men than women are affected.
- Color blindness usually involves the inability to distinguish between shades of red and green.
- There is no treatment for inherited color blindness.
- If colorblindness is caused by another condition, treating the underlying cause can help.



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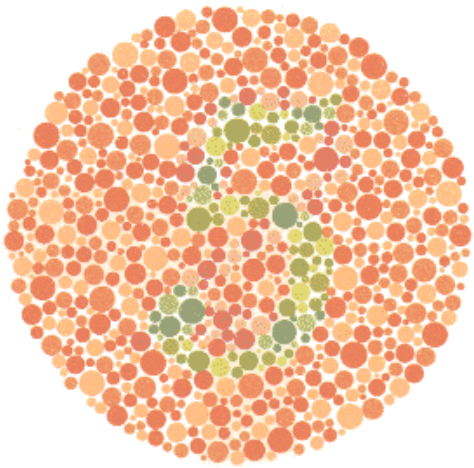

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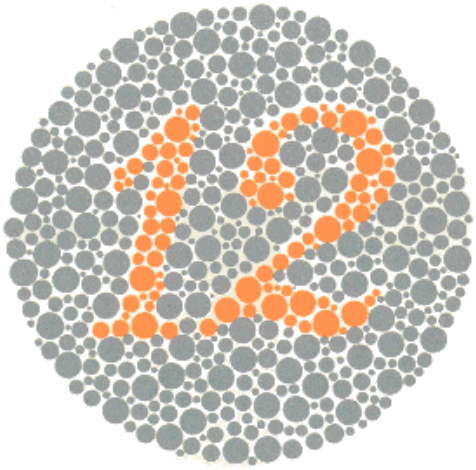

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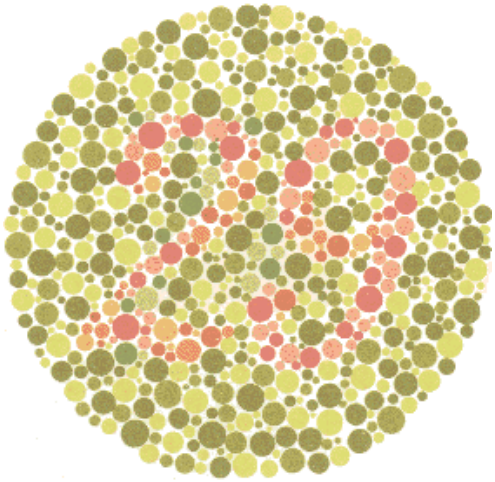

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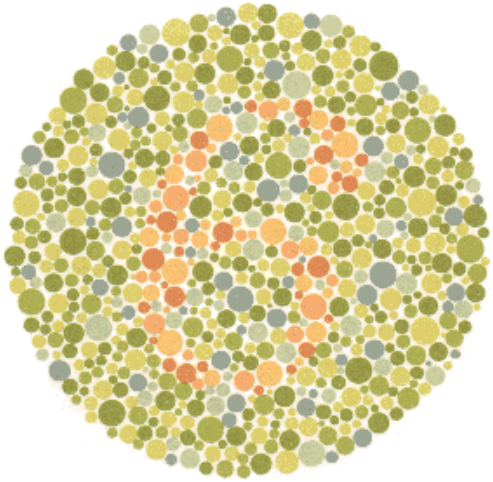

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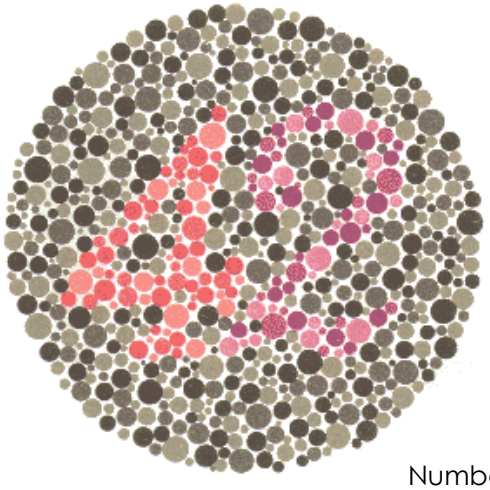


Number:

Expedition 6: Blue-Green — Black & White

EXPEDITION

Upon conclusion of Expedition 6, the Explorer will understand that the colors Black and White are also colors, albeit not found in the color spectrum. The Explorer will at the end of the Discovery Project that White is the presence of all wavelengths of color and Black the absence of all wavelengths of color. They additionally will understand the reflective and absorptive properties of light and that light contains energy producing heat when absorbed. The Explore will be able to demonstrate in the Discovery Project the use of a thermometer and recognize t temperature differences, demonstrable as heat energy between a White object and Black objects. At the culmination of the Discovery Project, the Explorers will be examined via a question and answer session directed to elicit further discussion of reflection and absorption of light energy.

EXPEDITION OUTLINE

Objective: Expedition module 6: Blue-Green ~ Black and White, explores the presence of all colors or the absence of all color wavelength within one's visual perception. Both White and Black are not included in the spectrum of light as demonstrated in Discovery Project 4. White and black have special properties. All light is energy manifest in the form of heat and radiation. Discovery Project 6 undertakes to demonstrate why the color White, which is the reflection of all wavelength of light is cooler than the absorption of all wavelengths of light which generates heat. The primary objective of the Exploration is to capture the imagination of the Explorer through the demonstration and recording of temperature variations between white and black objects. This Expedition should comprise approximately 30 minutes of instructional time.

Methods: Initial instruction begins with lecture following the direction presented in a PowerPoint slide presentation, which follows three design points: Lecture and discussion, The Discovery Project for hands-on implementation of concepts, and Discovery Assessment to evaluate learning.

Media: Slide presentation, Discovery Project Sheets, Materials required for Discovery Project. Video can be utilized within or outside the prescribed curriculum. However, the considerations to the time involved may lend itself to extracurricular viewing.

EXPEDITION RESOURCES

VIDEO

WEBSITES

POWERPOINTS

ASSESSMENT

1. What is White?
2. What is Black?
3. Does Light produce Energy?
4. Which color was the coolest?
5. Which color was the warmest?

NOTES

DISCOVERY PROJECT: A MATTER OF BLACK & WHITE

The concept of light is composed of multiple wavelengths and an object's property to absorb or reflect various wavelengths of color can be further demonstrated showing the properties of the colors White and Black. Because light is an energy particle, e.g., a photon, objects that reflect that energy remains cool. Objects that absorb light energy particles become warm to hot. This Discovery Project will examine the thermal differences between a black object and a white object illustrating the thermal properties of light.

You need:

- Black construction paper cut into equally sized squares for each Explorer
- White construction paper cut into equally sized squares for each Explorer
- A thermal sensing device as simple as a mercury bulb thermometer, a cooking thermometer, or a laser thermometer.

White objects, in this case, the white paper, reflects all color particles, black on the other hand absorbs all particles. It is the reason a white car is cooler than a black car, or a white tee shirt is cooler than a black tee shirt.

Image 8

PROCEDURE:

1.) Explorers will place each piece of black and white paper side by side in the sun.
2.) They will wait for 5 minutes and then measure the temperature of the white paper and then the black to compare the surface temperature of both.

Addition instruction on the use of use of a thermometer, mercury, and the differences between Celsius and Fahrenheit measurements might be explored.

Image 9

Expedition 7: Green — Gamut

EXPEDITION OBJECTIVE

Color Gamut is introduced to the Explorer who, after Expedition Green will understand that the combinations of colors that one sees differ between digital color representation, printing representation of color and artistic application of paint. The Guide will initially demonstrate the combining of digital colors Red, Green, and Blue and then afford the Explorers through the Discovery Project to experiment with the digital colors. The Explorers will be able to create and understand the creation of yellow, magenta and cyan from the RGB color gamut. They will then be prepared to move forward with further exploration in the upcoming Explorations: 8, 9, and 10. After the Discovery Project, the Explorers will be questioned over the subject matter, correcting as required to ensure at minimum 95% accuracy. The Guide will encourage question and open discussion of what the Explorers have learned.

EXPLORATION OUTLINE

Objective: Beginning with Expedition 7: Green ~ Gamut, the focus begins to shift to the various gamut of color: Digital (RBG), Printing (CYMK) and Paint (RYB). The Expedition gives explanation and introduction to the idea of gamut and the specificity and unique properties of each relative to how the color is created, e.g., through additive or subtractive color mixing. The Discovery Project will demonstrate the additive mixing of Blue, Red and Green light creating visual magenta, cyan, yellow and white. The time estimates for the presentation of this Expedition is approximately 20-30 minutes.

Methods: Initial instruction begins with lecture following the direction presented in a PowerPoint slide presentation, which follows three design points: Lecture and discussion, The Discovery Project for hands-on implementation of concepts, and Discovery Assessment to evaluate learning.

Media: Slide presentation, Discovery Project Sheets, Materials required for Discovery Project. Video can be utilized within or outside the prescribed curriculum. However, the considerations to the time involved may lend itself to extracurricular viewing.

EXPEDITION RESOURCES

VIDEO

WEBSITES

POWERPOINTS

ASSESSMENT

1. What colors gamut does a computer monitor use?
2. What color gamut does an oil painter use?
3. What color gamut does a printer use?
4. Is a printer and additive or subtractive color gamut?
5. When one mixes red, blue and green light together, what color is produced?
6. When one mixes cyan, magenta and yellow together, what color is produced?

NOTES

DISCOVERY PROJECT: ADDITIVE AND SUBTRACTIVE COLOR GAMUTS

Because color is both additive and subtractive, this Discovery Project is designed to demonstrate that principle.

You need:

- A flashlight with a blue lens
- A flashlight with a red lens
- A flashlight with a green lens

Red, Green, and Blue light (RGB) are additive colors. When they are mixed as visible light, their light will mix photons together to create a new color.

PROCEDURE:

1. Mix blue light with green and cyan is formed.
2. Mix green light with red light and yellow is formed.
3. Mix red light with blue light and magenta is formed
4. Mix all three colors together, and white light is formed.

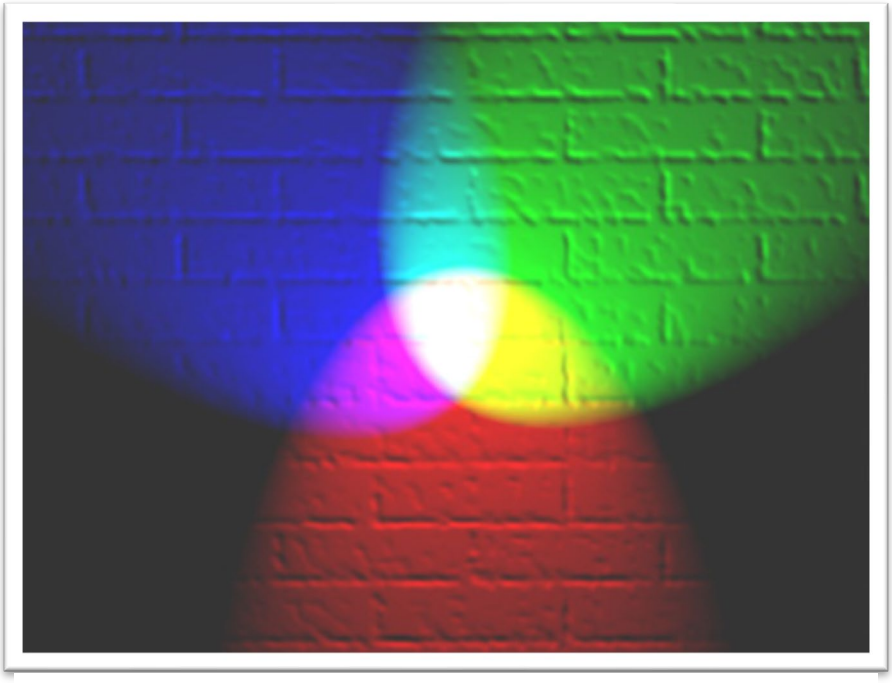


Image 10

Expedition 8: Yellow-Green — Digital Color

EXPEDITION

At the conclusion of Expedition Yellow-Green, the Explorer will have experience mixing digital colors. The Explorer will be able to open the Stanford.edu website and manipulate the RGB Gamut and understand the additive properties of color mixing of RGB. The Explorers will have knowledge and skill pertinent to their understanding of digital color and the digital aspects of binary color. Upon conclusion, the Explorers will be asked specific questions to test for understanding and comprehension of the concepts and use of RGB digital color gamut.

EXPEDITION OUTLINE

Objective: Expedition 8: Yellow-Green ~ Digital Color begins to examine the first of the gamut introduced in Expedition 7: RGB – Computerized, i.e., digital or binary color. Due to the proliferation of digital devices in the last 30 years, digital color finds its way into every aspect of daily life, from monitors, televisions, camera, telephones, et.al. Within this Expedition, the binary components of RGB color are explored. The Discovery Project affords the Explorer a hands-on experience with three sliders via an online program which lets the Explorer play and create digital colors and specifically see the binary composition of each color between 0 and 255 for Red, Green, and Blue. Anticipate time requirements will range between 30 and 40 minutes for this Exploration and Discovery.

Methods: Initial instruction begins with lecture following the direction presented in a PowerPoint slide presentation, which follows three design points: Lecture and discussion, The Discovery Project for hands-on implementation of concepts, and Discovery Assessment to evaluate learning.

Media: Slide presentation, Discovery Project Sheets, Materials required for Discovery Project. Video can be utilized within or outside the prescribed curriculum. However, the considerations to the time involved may lend itself to extracurricular viewing.

EXPEDITION RESOURCES

VIDEO

WEBSITES

POWERPOINTS

ASSESSMENT

1. What does R represent in RGB?
2. Where is RGB color found?
3. What did the chicken cross the road?
4. How are RGB colors mixed?
5. What is the RGB binary number for White?
6. What is the RGB binary number for Black?

NOTES

DISCOVERY PROJECT: EXPERIMENTING WITH RGB COLOR

You need:

- Internet connection to access the website

Going to the website below lets you play with the RGB scheme, combining red, green, and blue light to make any color. The sliders control the red green and blue lights, each ranging from 0 (off) to 255 (maximum). The arrow keys work too. The intersecting rectangles show the result of adding the red, green, and blue light together -- any color can be created in this way.

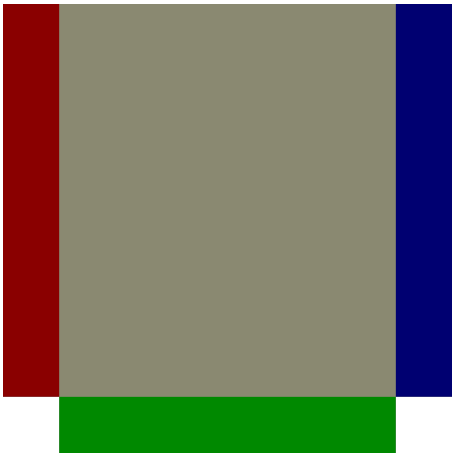
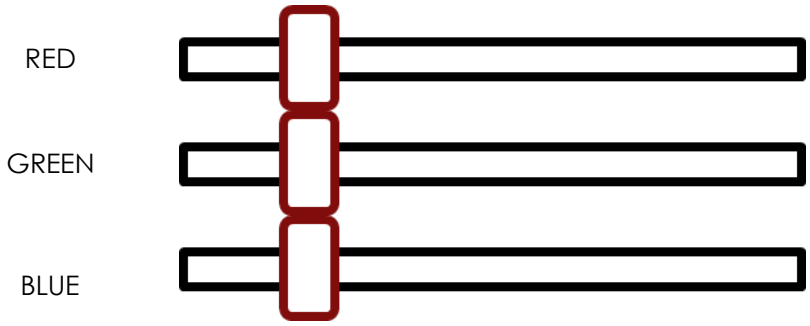


Image 11

- Pure red, green, or blue can be made with just that slider, varying brightness
- Combine 2 pure colors
- red + blue → purple
- green + blue → turquoise
- red + green → yellow
- Other combinations...
- All at max (255) → white
- All at min (0) → black
- Dark yellow -- make yellow, then reduce both red and green equally
- Light, pastel green -- make pure green, then turn up both red and blue some equally (going towards white)
- Light gray -- make white, then turn all three down equally

Play with Sliders on the website. The sliders will look similar to these:



Expedition 9: Yellow — Ink & Dye Color

EXPEDITION

At the end of Expedition Yellow, the Explorers will have comprehended the difference between digital colors (RGB) and Ink and Dye colors (CYMK) gamut. Through the use of a Pantone™ Color Swatch book, the Explorers will be able to match and determine Pantone ™colors possibly used in the reproduction of a famous work of art. The Explorers will be able to demonstrate their knowledge of the CYMK gamut and validate their skills in color matching. Upon completion of the Discovery Project, a spokesperson will present their findings and will be subsequently questioned for knowledge and retention of the key points presented throughout the Expedition.

EXPEDITION OUTLINE

Objective: Expedition 9: Yellow ~ Ink & Dye Color starts the discussion of the color gamut of the CYMK colors and the similarities and differences between RGB color, an additive color gamut, and CYMK, a subtractive color gamut. The Explorer will be able to understand the differences between spot and process color printing. The Explorers will be familiar with Pantone™ color matching and how it relates to printing with ink or dye. The Discovery Project will afford the group of Explorers to examine a famous painting and attempt to match the colors with a Pantone™ swatch book. Time management of this Expedition should focus on 30 minutes.

Methods: Initial instruction begins with lecture following the direction presented in a PowerPoint slide presentation, which follows three design points: Lecture and discussion, The Discovery Project for hands-on implementation of concepts, and Discovery Assessment to evaluate learning.

Media: Slide presentation, Discovery Project Sheets, Materials required for Discovery Project. Video can be utilized within or outside the prescribed curriculum. However, the considerations to the time involved may lend itself to extracurricular viewing.

EXPEDITION RESOURCES

VIDEO

WEBSITES

POWERPOINTS

ASSESSMENT

1. What does the K stand for in CYMK?
2. Where is Magenta in the rainbow?
3. What is Spot Printing?
4. What is Process Printing?
5. What's a Pantone™?
6. Are Ink colors created by the binary representation of color or by mathematical percentages or Ratios?
7. Which has the largest color gamut, CYMK or RGB?

NOTES

DISCOVERY PROJECT: EXPERIMENTING WITH RGB COLOR

Printing at home, at school or at the office is a common staple of today's digital world. An understanding of the CMYK color gamut is necessary to reproduce photos, graphics, and documents as seen on the computer monitor. CMYK is also the standard for spot and process color printing at commercial printing companies. Knowledge of the various processes is required by our Explorers to understand what goes into the making of printed magazines, boxes, billboards and flyers. This Expedition will delve into one component of CMYK: The Pantone™ Colors

You need:

- A Pantone™ Color Swatch book
- A colored print such as great master painting, for example, Monet.

PROCEDURE

1. The Explorers will be divided up into groups
2. The Explorer group will examine the supplied print
3. The Explore group will compile a list of all the colors that they can identify and name in the print
4. The Explorer group will then begin a list of all the colors that they cannot identify or give a name to
5. Using the Pantone™ color swatch book, they seek to find an exact match for the color that has been identified in each list.
6. When complete, a spokesperson for each group will present their findings and compare identification by way of Pantone™ color codes.

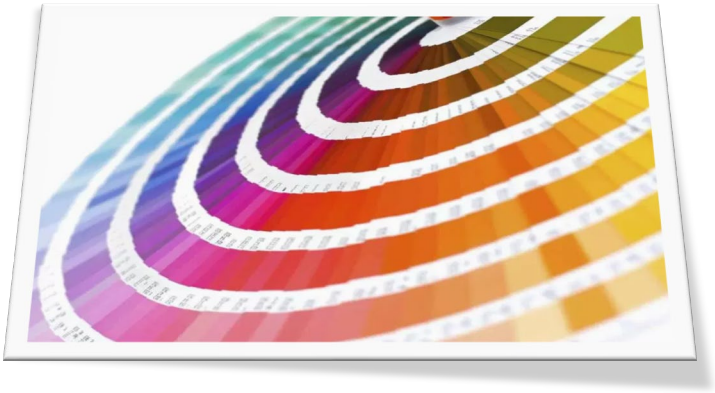


Image 12

Expedition 10: Yellow-Orange — Paint Color

EXPEDITION

Upon completion of Expedition Yellow-Orange, the Explorer will have learned the RYB color Gamut and its relationship to the digital (RYB), and print (CYMK) colors. The participant will be able to mix the primary colors to achieve the secondary colors of the RYB gamut in preparation for Expedition 11: Color Relationships. The Explorers will apply the knowledge of the RYB palette and demonstrate their skills at combining colors Red, Yellow and Blue to produce, Orange, Violet, and Green. After the Discovery Project, questions will be asked of the Explorers to demonstrate knowledge learned and retention of subject matter. Open dialogue and discussion should be encouraged between Explorers.

EXPEDITION OUTLINE

Objective: Expedition 10 – Paint Color introduces the Explorer one step further into the world of color with an exploration of the Red, Yellow and Blue color wheel, instantiating the foundational knowledge required to comprehend the relationship between colors of paint, and how paint differs from the RGB, and CYMK gamut. The Discovery project will re-enforce the subject matter by affording the Explorer the opportunity to mix Red, Yellow and Blue paint and create the secondary colors of Orange, Violet, and Green. After the Discovery Project, the Explorers will partake in a question and answer session, eliciting addition dialog and interaction among the Explorers. Time requirement should range between 30 and 40 minutes.

Methods: Initial instruction begins with lecture following the direction presented in a PowerPoint slide presentation, which follows three design points: Lecture and discussion, The Discovery Project for hands-on implementation of concepts, and Discovery Assessment to evaluate learning.

Media: Slide presentation, Discovery Project Sheets, Materials required for Discovery Project. Video can be utilized within or outside the prescribed curriculum. However, the considerations to the time involved may lend itself to extracurricular viewing.

EXPEDITION RESOURCES

VIDEO

WEBSITES

POWERPOINTS

ASSESSMENT

1. Name the three Primary colors of RYB gamut.
2. What are the three secondary colors of the RYB gamut?
3. What are the six tertiary colors of the RYB gamut?
4. Where would one most like use RYB colors?
5. Is RYB an additive color or a subtractive color?

NOTES

DISCOVERY PROJECT: DISCOVERY OF RYB PAINT

There is nothing like playing with paint to bring out the hidden artist within. This Expedition is designed to allow the Explorer to discover the magic of color mixing of the primary colors of Red-Yellow-Blue (RYB).

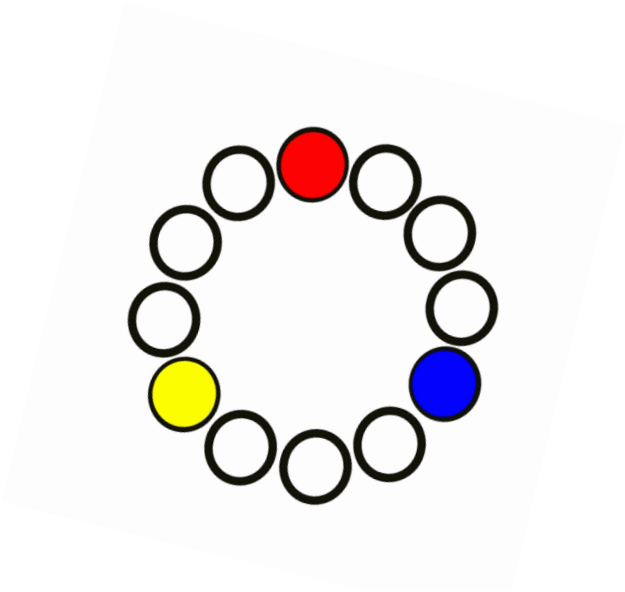


Image 13

You need:

- 2 tubes of yellow acrylic paint
- 1 tube of red acrylic paint
- 1 tube of Blue acrylic paint
- A brush for each explorer
- A paper plate for each explorer
- A plastic cup of water for each Explorer
- A few rolls of paper towels for the whole Expedition
- A pencil for each explorer
- Water

PROCEDURE

1. Give each Explorer a paper plate, a pencil, a ½ cup of water, and three paper towels.
2. Have each write out the numbers from 1 to 12 to represent a clock.
3. Place a dab of Red acrylic paint on the one (1)
4. Place a dab of Blue acrylic paint on the five (5)
5. Place two dabs of Yellow acrylic paint on the nine (9)
6. The Explorer will now mix the secondary complementary colors on the three (3) which will be obtained by combining the Red and Blue acrylic paint until a violet is formed. When successfully completed, clean brush in a cup of water and dry brush with paper towel.
7. The Explorer will now mix the secondary complementary colors on the seven (7) which will be obtained by combining the Blue and yellow acrylic paint until a green is formed. When successfully completed, clean brush in a cup of water and dry brush with paper towel.
8. The Explorer will now mix the secondary complementary colors on the eleven (11) which will be obtained by combining the Yellow and Red acrylic paint until orange is formed. When successfully completed, clean brush in a cup of water and dry brush with paper towel.
9. Upon successful completion, the remaining numbers can be mixed if desired.

Image 14

Expedition 11: Orange — Color Relationships

EXPEDITION

At the end of Expedition Orange, the Explorer will understand the relationship of the primary colors, secondary colors and tertiary colors of the Red, Yellow, Blue (RYB) color gamut. The Explorers will be able to mix all twelve colors of the basic RYB palette and be able to apply them to a canvas in the creation of their own particular artistic creation. Demonstration of their obtained knowledge, skills and attitude will be assured with the completion of the Discovery Project. At the conclusion of the Discovery Project, each participant shall show their artistic expression to fellow Explorers. To test for knowledge retention of the RYB color gamut, a question and answer assessment will be conducted and directed to the Explorers for contemplation and discussion until a conscientious can be reached collectively to answer the presented question.

EXPEDITION OUTLINE

Objective: Expedition 11: Orange ~ Color Relationships begins the second part of the continuation of Expedition 10 with a further understanding of the relationships between Red, Yellow, and Blue in the Paint Color Wheel. The Discovery Project builds on the skills learned in the previous Discovery Project. The Discovery Project 11 reinforces the Discovery Project 10 skills, taking them to the final step of mixing the Tertiary colors, thus completing the 12 colors of the color wheel. Then the Explorer will create a painting of their own choosing. Upon completion of the Exploration, the Explorers will be questioned on the subject matter and will show their painting to the other Explorers. Explorers should be encouraged to clap and give each other praise for their creation. The elapsed time required for this Expedition should be approximately 35-45 minutes.

Methods: Initial instruction begins with lecture following the direction presented in a PowerPoint slide presentation, which follows three design points: Lecture and discussion, The Discovery Project for hands-on implementation of concepts, and Discovery Assessment to evaluate learning.

Media: Slide presentation, Discovery Project Sheets, Materials required for Discovery Project. Video can be utilized within or outside the prescribed curriculum. However, the considerations to the time involved may lend itself to extracurricular viewing

EXPEDITION RESOURCES

VIDEO

WEBSITES

POWERPOINTS

ASSESSMENT

1. Name the three Primary colors of RYB gamut.
2. What is the complementary color of Red?
3. What is the complementary color of Blue?
4. What is the complementary color of Yellow?
5. What is the complementary color of Orange?
6. What is the complementary color or Violet?
7. What is the complementary color of Green?

NOTES

DISCOVERY PROJECT: DISCOVERING COLOR RELATIONSHIPS

Building on the Discovery Project of Expedition 10, the Explorer will now experience the relationships between colors of the RYB color wheel by building a palette of colors: Primary, Secondary and Tertiary.

You need:

- 2 tubes of yellow acrylic paint
- 1 tube of red acrylic paint
- 1 tube of Blue acrylic paint
- A brush for each Explorer
- A paper plate for each Explorer
- A plastic cup of water for each Explorer
- A few rolls of paper towels
- 9 x 12 Canvas paper, board, or stretched
- Water

Image 15

PROCEDURE

1. Give each Explorer a paper plate, a ½ cup of water, and three paper towels.
2. Place a dab of Red acrylic paint on a paper plate
3. Place a dab of Blue acrylic paint on the paper plate
4. Place two dabs of Yellow acrylic paint on the paper plate
5. The Explorer will now mix the secondary complementary colors which will be obtained by combining the Red and Blue acrylic paint until a violet is formed. When successfully completed, clean brush in a cup of water and dry brush with paper towel.
6. The Explorer will now mix the secondary complementary colors which will be obtained by combining the Blue and yellow acrylic paint until green is formed. When successfully completed, clean brush in a cup of water and dry brush with paper towel.
7. The Explorer will now mix the secondary complementary colors) which will be obtained by combining the Yellow and Red acrylic paint until orange is formed. When successfully completed, clean brush in a cup of water and dry brush with paper towel.
8. The Explore will now apply the paint to the small canvas in any manner desired to create an artistic expression the Explorer see fit to paint.

Image 16

Expedition 12: Red-Orange — Color Terms

EXPEDITION

As Expedition Red-Orange comes to a close, the Explorers will have discovered the relationship between tints, tones, and shades and how the addition of White, Grey, and Black influences the RYB color gamut. The Explorers will be able to mix and demonstrate the results of creating a tint, tone, and shade of Red, Yellow and Blue acrylic paint. With this knowledge, the Explorers will be able to create a palette applicable to the creation of artistic works with a full understanding of the RYB color palette's potential. Their acquired skills will be utilized when called to create an artistic painting, and they will have confidence in their understanding of RYB paint. Upon conclusion of the Discovery Project, the collective Explorers will once again be questioned for knowledge retention and requested to share their learning experiences with fellow Explorers.

EXPEDITION OUTLINE

Objective: Expedition 12: Red-Orange ~ Color Terms takes the Explorers to a final Exploration developing a further sophistication of the vocabulary of color as well as a Discovery Project aimed to develop their understanding of Tints, Tones, and Shades. The introduction of Black, White and Gray will further their knowledge, skills, and attitudes toward artistic expression. The Discovery Project will give each Explorer the opportunity to develop tints and shades of Red, Yellow, and Blue. At the culmination of the Exploration, the Explorer will be given the question to answer and discuss and should be queried as to their overall understanding as a review of the twelve Expeditions. Expedition 12 should be accomplished in approximately 45 minutes to an hour.

Methods: Initial instruction begins with lecture following the direction presented in a PowerPoint slide presentation, which follows three design points: Lecture and discussion, The Discovery Project for hands-on implementation of concepts, and Discovery Assessment to evaluate learning.

Media: Slide presentation, Discovery Project Sheets, Materials required for Discovery Project. Video can be utilized within or outside the prescribed curriculum. However, the considerations to the time involved may lend itself to extracurricular viewing.

EXPEDITION RESOURCES

VIDEO

WEBSITES

POWERPOINTS

ASSESSMENT

1. What is the difference between Red and Orange?
2. What would you call the color Pink: A tint, a tone or a shade?
3. What two colors make Grey?
4. Grey is used to making a tint, tone or a shade of a color?
5. How many values of Grey are there?
6. What is another word for Hue?
7. What is the saturation of a color?

NOTES

DISCOVERY PROJECT: DISCOVERING TINTS, TONES & SHADES

It is now time to combine all the elements of light and color together. This Expedition will focus on an understanding of tints, tones, and shades of a hue.

You need:

- 1 tube of a White tube of acrylic paint
- 1 tube of Black acrylic paint
- 2 tubes of yellow acrylic paint
- 1 tube of red acrylic paint
- 1 tube of Blue acrylic paint
- A brush for each Explorer
- A paper plate for each Explorer
- A plastic cup of water for each Explorer
- A few rolls of paper towels
- 9 x 12 Canvas paper, board, or stretched
- Water

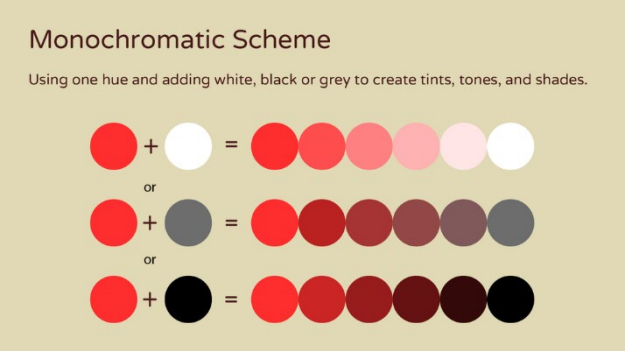


Image 17

PROCEDURE

1. Give each Explorer a paper plate, a ½ cup of water and three paper towels.
2. Place a large dab of White acrylic paint on paper plate.
3. Place a small dab of Black acrylic paint on paper plate.
4. Now mix some black and white acrylic paint together to create grey paint.
5. Place a dab of Red acrylic paint on the paper plate.
6. Now mix some Red and White acrylic paint together to make Pink and apply to the canvas in a 2-inch square.
7. Now mix some Red and the grey acrylic paint that was mixed earlier together to make a Greyed -Red and apply to the canvas in a 2-inch square.
8. Now mix some Red and Black acrylic paint together to make a Dark Red and apply to the canvas in a 2-inch square.
9. Now compare: The Tint, Tone, and Shade of Red
10. Now try with Blue, Yellow or any Secondary color mixed.

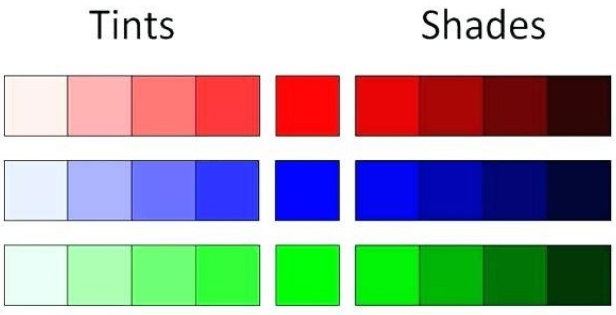


Image 18

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