

The Family Photo of Art, Science and Technology

Grade Level: Middle School Connections

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Length of Unit: 8

I. ABSTRACT

A. Darkrooms, chemicals, temperamental subjects and roll upon roll of film that needs to be shot, developed and sorted through before THE picture emerges. This was the tale of many a photographer with the advent of the modern mechanical camera. But is this the photography of today? Because of science and technology the “now” photographers are doing everything that they can to keep up with the digitalization of the camera. Enter digital photography and a whole new art from that is scientifically and technologically sound. Just like the ideas for modern computers seemed to have evolved out of the futuristic zaniness of some old science fiction movie, the modern camera has emerged as another unbelievable leap in technology. Dick Tracy’s camera wrist watch? A cell phone with camera capabilities? Movies filmed on traditional celluloid? Soon to be a thing of the past as even theatres move forward and download movies with digital precision. Come join us as we explore the photographic techniques of the past, the science of tomorrow, and how they are both beautifully and artistically linked into beautiful translations of the common everyday objects of nature.

II. OVERVIEW

A. Concept Objectives

1. Students will explore and understand the photographic techniques of the past.
2. Students will explore and understand current photographic processes and traditional applications.
3. Students will explore and understand the photographic science of tomorrow.
4. Students will explore and understand how the photographic techniques of the past and the science of tomorrow are beautifully and artistically linked into translations of the common everyday objects of nature.

B. Content from the *Core Knowledge Sequence*

1. Color: Observe how color can create different feelings and how certain colors can see “warm” or “cool” (14)
2. Measurement: Relate the changes in measurement with a change of scale to the units used (174)
3. Chemical Bonds and Reactions: Kinds of Reactions (176)
4. Painting Since World War II: Willem de Kooning, Mark Rothko, Andy Warhol, Roy Lichtenstein, Romare Bearden, Jacob Lawrence (192)
5. Photography: Examine representative artists and works, including Alfred Steiglitz, Margaret Bourke-White, Ansel Adams (192)
6. Electromagnetic Radiation and Light: The Electromagnetic Spectrum (200)
7. Electromagnetic Radiation and Light: Refraction and reflection (200)
8. Waves and electromagnetic radiation (200)
9. Science Biographies: James Maxwell (202)
10. Technology: digital cameras and their workings

C. Skill Objectives

1. Students will create an enlarged grid system proportionally accurate to the original smaller grid of a photograph.
2. Students will enlarge a photograph to proportional sizes using a grid system.
3. Students will manipulate the scale of a common geometric shape (circle) to replicate value scale within each pixel.
4. Students will demonstrate how these value changes within each pixel help to create larger images when combined.
5. Students will create a bichrome photograph using photosensitive paper.
6. Students will manipulate image to create a color photo that stimulates certain feelings according to the colors used.
7. Students will describe James Maxwell's contribution to science.
8. Students will break down the electromagnetic spectrum to explore wavelengths of visible light.
9. Students will collaborate with others to create a group collage made from finished products from Lesson Three.
10. Students will photocopy their individual works several times and use markers to manipulate the color. They will use these images to create another collage.
11. Students will compare and contrast pinhole cameras and their products with mechanical cameras and their products.
12. Students will differentiate between convex and concave and refraction and reflection.
13. Students will learn how to manipulate and image to create an abstracted form, as in the works of Willem de Kooning.
14. Students will identify chemical reactions involved in the process of developing film.
15. Students will compare types of waves involved in the medical field.
16. Students will identify CT scans through the use of pixels.
17. Students will learn how to operate a digital camera and all of the photographic features that are available (such as cropping, zooming, etc.).
18. Students will take three pictures of landscape images which have been manipulated.
19. Students will scan images into a computer.
20. Students will further manipulate images to produce black and white photos as well as sepias.
21. Students will render the sepia prints with markers, water color paints and artist quality color pencils.

III. BACKGROUND KNOWLEDGE

A. For Teachers

1. www.alternativephotography.com
2. www.HowStuffWorks.com
3. Giancoli, Douglas C. *Physics: Principles with Applications*. Upper Saddle River, New Jersey: Prentice Hall, 1998, ISBN 0-13-611971-9
4. O'Brien, Michael F. and Norman Sibley. *The Photographic Eye: Learning to See with a Camera*. Worcester, Massachusetts: Davis Publications, 1988, ISBN 0-87192-193-6

B. For Students

1. Elements of Art
2. Kinds of Pictures: Landscapes
3. Abstract Art
4. Art History: Periods and Schools (Renaissance, Realism, Expressionism and Abstraction, Modern American Painting)
5. The Human Body
6. Light and Optics
7. Chemistry: Basic Terms and Concepts, Matter and Change

IV. RESOURCES

- A. computers with Internet access
- B. digital cameras
- C. art supplies

V. LESSONS

Lesson One: Photo Graphing

A. *Daily Objectives*

1. Concept Objective
 - a. Students will explore and understand current photographic processes and traditional applications.
2. Lesson Content
 - a. Photography: Examine representative artists and works, including Alfred Steiglitz, *The Steerage*
 - b. Measurement: Relate the changes in measurement with a change of scale to the units used
3. Skill Objectives
 - a. Students will create an enlarged grid system proportionally accurate to the original smaller grid of a photograph.
 - b. Students will enlarge a photograph to proportional sizes using a grid system.

B. *Materials*

1. B/W photograph
2. paper
3. pencil
4. ruler
5. scissors
6. eraser
7. paper cutter
8. computer
9. B/W printer
10. scanner

C. *Key Vocabulary* (definitions from www.dictionary.com)

1. contrast: the difference in brightness between the light and dark areas of a picture, such as a photograph or video image
2. enlarge: to expand

3. grid: a pattern of regularly spaced horizontal and vertical lines forming squares on a map, a chart, an aerial photograph, or an optical device, used as a reference for locating points
4. Imitationalism (Realism): the representation in art or literature of objects, actions, or social conditions as they actually are, without idealization or presentation in abstract form
5. increment: the process of increasing in number, size, quantity, or extent
6. Lange, Dorothea: American photographer remembered for her documentary portraits of rural workers during the Depression
7. pixel: the basic unit of the composition of an image on a television screen, computer monitor, or similar display
8. proportion: a part considered in relation to the whole
9. render: to express in another language or form; translate
10. Stieglitz, Alfred: American photographer noted for black and white photography

D. *Procedures/Activities*

1. Students locate a black and white photograph of a portrait that is 3 in. by 4 in.
2. Students will scan photograph twice (one to be used in later lesson).
3. Photograph will be trimmed to exact right angles using grid system on standard paper cutter.
4. Using a ruler and pencil, students will grid photograph to quarter-inch increments.
5. Students will grid the drawing paper (measuring 12 in. by 16 in) using one inch increments.
6. Students will replicate what they see in the smaller squares of the photograph into the larger squares of the drawing paper by plotting points similar to algebraic graphs.
7. Students will finish the drawing by rendering the image in high and low contrast of gray value.

E. *Assessment/Evaluation*

1. rubric (see Appendix A)
2. possible installation of pieces in local gallery

Lesson Two: Enlarged Pixelation

F. *Daily Objectives*

1. Concept Objective
 - a. Students will explore and understand current photographic processes and traditional applications.
2. Lesson Content
 - a. Painting Since World War II: Roy Lichtenstein
 - b. Measurement: Relate the changes in measurement with a change of scale to the units used
3. Skill Objectives
 - a. Students will manipulate the scale of a common geometric shape (circle) to replicate value scale within each pixel.
 - b. Students will demonstrate how these value changes within each pixel help to create larger images when combined.

G. *Materials*

1. one enlarged scanned B/W photograph
2. paper
3. pencil
4. ruler
5. scissors
6. eraser
7. black marker

H. *Key Vocabulary*

1. Formalism: a method of aesthetic analysis that emphasizes structural elements and artistic techniques rather than content, especially in literary works
2. Lichtenstein, Roy: American pop artist best known for his large-scale depictions of comic book panels
3. photocopy: to make a photographic reproduction of
4. pixelation: process of delineating a visual image by breaking it up into pixels or individual cells
5. positive and negative images: an image in which the light areas of the object rendered appear dark and the dark areas appear light (the opposite being true for positive images)
6. render: to express in another language or form; translate
7. Symbolism: the movement, theory, or practice of the late 19th-century Symbolists
8. scale: A system of ordered marks at fixed intervals used as a reference standard in measurement

I. *Procedures/Activities*

1. Each student will zoom and crop original photograph and enlarge specific area. Each student will be assigned a quadrant from one class photograph to enlarge.
2. Students will print enlarged specific area and cut a 3 in. by 4 in. section.
3. Students will grid this photograph in identical manner as photograph is Lesson One.
4. Students will grid piece of drawing paper, measuring 12 in. by 16 in., in manner similar to Lesson One.
5. Students will manipulate a common geometric shape (circle) by enlarging or decreasing its size to represent values of gray in the original photograph.
6. Students will combine products to create a larger, final image, which will be interpreted at a distance as representative of the original image.

J. *Assessment/Evaluation*

1. rubric (see Appendix A)
2. possible installation of piece in common student area

Lesson Three: Sun Photo

K. *Daily Objectives*

1. Concept Objective
 - a. Students will explore and understand how the photographic techniques of the past and the science of tomorrow are beautifully and artistically linked into translations of the common everyday objects of nature.

2. Lesson Content
 - a. Color: Observe how color can create different feelings and how certain colors can see “warm” or “cool”
 - b. Photography: Examine representative artists and works, including Ansel Adams
 - c. Painting Since World War II: Mark Rothko
 - d. Electromagnetic Radiation and Light: The Electromagnetic Spectrum
 - e. Science Biographies: James Maxwell
3. Skill Objectives
 - a. Students will create a bichrome photograph using photosensitive paper.
 - b. Students will manipulate image to create a color photo that stimulates certain feelings according to the colors used.
 - c. Students will describe James Maxwell’s contribution to science.
 - d. Students will break down the electromagnetic spectrum to explore wavelengths of visible light.

L. *Materials*

1. photosensitive paper (each sheet divided into four pieces)
2. drawing paper (12 in. by 16 in.)
3. glass cut to fit photosensitive paper
4. Prisma colors
5. leaf form or other biomorphic shape
6. eraser
7. mat board or other cardboard backing

M. *Key Vocabulary*

1. Adams, Ansel: American photographer noted for his magnificent black-and-white photographs of the American wilderness
2. bichrome: having two colors
3. cool colors: colors, such as blue and green, that produce the impression of coolness
4. exposure: the act of exposing sensitized photographic film or plate
5. Maxwell, James: British physicist who made fundamental contributions to electromagnetic theory and the kinetic theory of gases
6. palette: the range of colors used in a particular painting or by a particular artist
7. photosensitive: sensitive or responsive to light or other radiant energy
8. positive and negative images: an image in which the light areas of the object rendered appear dark and the dark areas appear light (the opposite being true for positive images)
9. warm colors: predominantly red or yellow in tone

N. *Procedures/Activities*

1. Students will place the leaf form or shape on photosensitive paper that has been backed with the mat board, covering with glass that has been cut to fit.
2. Students will then expose paper to direct sunlight for a matter of minutes, according to directions on paper.
3. Students will remove glass and leaf from paper and rinse under warm water until the negative of the image begins to expose. Paper must be dried for 24 hours before next step.

4. Students will receive a handout of a color wheel and will learn the differences between the warm and cool palettes. Students will look at examples using warm and cool colors, including works by Mark Rothko, and the emotional meanings that are associated with certain colors.
5. Using the school library or an Internet search, students will describe the life and contributions of James Maxwell. Each group should present their topic as a “Top Three” list. For example, the Top Three Family and Friends of James Maxwell.
6. Students will differentiate between colors by learning their wavelengths on the visible light electromagnetic spectrum.
7. The negative part of the photosensitive paper is exposed as blue (cool color) and students will apply warm colors to the positive image (leaf form). Students can manipulate the color palettes to create a finished image.

O. *Assessment/Evaluation*

1. students divide images into warm and cool categories
2. students identify wavelengths of warm and cool colors

Lesson Four: Pop Art Collage

P. *Daily Objectives*

1. Concept Objective
 - a. Students will explore and understand the photographic techniques of the past.
 - b. Students will explore and understand how the photographic techniques of the past and the science of tomorrow are beautifully and artistically linked into translations of the common everyday objects of nature.
2. Lesson Content
 - a. Painting Since World War II: Romare Bearden
 - b. Painting Since World War II: Andy Warhol and Pop Art
3. Skill Objectives
 - a. Students will collaborate with others to create a group collage made from finished products from Lesson Three.
 - b. Students will photocopy their individual works several times and use markers to manipulate the color. They will use these images to create another collage.

Q. *Materials*

1. finished products from Lesson Three
2. original biomorphic item from Lesson Three
3. tape
4. scissors
5. mat board
6. glue
7. Prisma colors, markers
8. B/W copier

R. *Key Vocabulary*

1. Bearden, Romare: American painter and collagist whose subjects often are drawn from the African-American community and New York City street life
2. bi-chrome: having two colors

3. collaborate: to work together, especially in a joint intellectual effort
4. collage: an artistic composition of materials and objects pasted over a surface, often with unifying lines and color
5. concept: something conceived in the mind
6. pop art: a form of art that depicts objects or scenes from everyday life and employs techniques of commercial art and popular illustration
7. Warhol, Andy: American artist that as a leader of the pop art movement, he produced paintings and silk-screen prints of commonplace images, such as soup cans and photographs of celebrities

S. *Procedures/Activities*

1. Divide students into two groups. One for their individual collage and one for the group collage project.
2. Individually, students need to make several (at least nine) black and white photocopy images of original work from Lesson Three. These will be used in step 5.
3. Students will group together and collaborate their works to create a single work, similar to Romare Bearden's work. Students will attach the original biomorphic item to collage.
4. As a group, students will tape images together from the back.
5. As a group, students will place and glue entire structure onto mat board.
6. Individually, students will use the nine individual photocopies and manipulate the images by using Prisma colors and markers to create individual works of art.
7. Students will combine these images into a single larger image and mount on mat board to create a work similar to Andy Warhol's *Campbell Soup Can* image.

T. *Assessment/Evaluation*

1. rubric (see Appendix B)
2. installation of individual collages around group collage in public gallery

Lesson Five: Pinhole Camera

U. *Daily Objectives*

1. Concept Objective
 - a. Students will explore and understand the photographic techniques of the past.
2. Lesson Content
 - a. Photography: Examine representative artists and works, including Margaret Bourke-White
 - b. Electromagnetic Radiation and Light: Refraction and reflection
3. Skill Objectives
 - a. Students will compare and contrast pinhole cameras and their products with mechanical cameras and their products.
 - b. Students will differentiate between convex and concave and refraction and reflection.

V. *Materials*

1. pinhole camera (see Appendix C)
2. mechanical camera
3. pencil

4. paper
5. access to Internet

W. *Key Vocabulary*

1. *camera obscura*: A darkened chamber in which the real image of an object is received through a small opening or lens and focused in natural color onto a facing surface rather than recorded on a film or plate
2. concave: curved like the inner surface of a sphere
3. convex: having a surface or boundary that curves or bulges outward, as the exterior of a sphere
4. mechanical camera: an apparatus for taking photographs, generally consisting of a lightproof enclosure having an aperture with a shuttered lens through which the image of an object is focused and recorded on a photosensitive film or plate
5. pinhole camera: a portable version of *camera obscura* using actual film
6. reflection: to throw or bend back (light, for example) from a surface
7. refraction: the turning or bending of any wave, such as a light or sound wave, when it passes from one medium into another of different optical density

X. *Procedures/Activities*

1. Students should define convex and concave and identify common items that have both shapes.
2. Students define and look at examples of refraction (shining light through water) and reflection (a mirror).
3. Students complete an Internet search to discover how a mechanical camera operates. They should be shown examples of cameras and the resulting photographs including Margaret Bourke-White's Fort Peck Dam and architectural lines.
4. Students should write a paragraph, based on their research, explaining the operations of a mechanical camera, using the terms concave, convex, refraction and reflection.
5. Students should view and operate a pinhole camera. They should be shown the resulting photograph from a pinhole camera.
6. Students complete an Internet search to discover how a pinhole camera operates.
7. Students will write an essay, using appropriate vocabulary and diagrams, comparing the cameras and their photographs.

Y. *Assessment/Evaluation*

1. essay

Lesson Six: Polaroid Manipulative

Z. *Daily Objectives*

1. Concept Objective
 - a. Students will explore and understand the photographic science of tomorrow.
 - b. Students will explore and understand how the photographic techniques of the past and the science of tomorrow are beautifully and artistically linked into translations of the common everyday objects of nature.
2. Lesson Content
 - a. Painting Since World War II: Willem de Kooning
 - b. Chemical Bonds and Reactions: Kinds of Reactions

3. Skill Objectives
 - a. Students will learn how to manipulate and image to create an abstracted form, as in the works of Willem de Kooning.
 - b. Students will identify chemical reactions involved in the process.

AA. *Materials*

1. Polaroid SX 70 camera with film
2. ballpoint pens
3. paint and paintbrushes
4. paint surface according to paint medium (such as paper or canvas)

BB. *Key Vocabulary*

1. de Kooning, Willem: Dutch-born American painter and leader of the abstract expressionist school, characterized by unrestrained color and a violent treatment of subject matter
2. distortion: a change in the shape of an image
3. emulsion: a photosensitive coating, usually of silver halide grains in a thin gelatin layer, on photographic film, paper, or glass
4. manipulation: to move, arrange, operate, or control by the hands
5. Polaroid: a trademark used for a specially treated, transparent plastic capable of polarizing light passing through it, used in glare-reducing optical devices, or a trademark used for a camera and film that produce instant photographs

CC. *Procedures/Activities*

1. Students will view images by Willem de Kooning, such as *Woman and Bicycle*, and understand the distortion of images.
2. Students will identify the important components of instant film and the steps in its development. Students can use lecture, a general physics textbook or an Internet search to find this information.
3. In cooperative groups, students will produce a lesson for younger students identifying the major parts of film development.
4. Students take a picture using the Polaroid SX 70 camera. The best results will be of colorful still-life in a bright setting.
5. After letting the picture dry, students take a ballpoint pen and manipulate the image to their liking. This is accomplished by moving the underlying emulsion, without tearing the outside layer, and moving the images as a result.
6. Students then create an abstract painting, in the style of de Kooning, based on their manipulated Polaroid. They can use the paint of their choice on the appropriate surface.

DD. *Assessment/Evaluation*

1. lesson for younger students (see Appendix D)
2. painting

Lesson Seven: The Importance of Pixel Size: Is that a Leg or a Lung?

EE. *Daily Objectives*

1. Concept Objective
 - a. Students will explore and understand the photographic science of tomorrow.

2. Lesson Content
 - a. Waves and electromagnetic radiation
3. Skill Objectives
 - a. Students will compare types of waves involved in the medical field.
 - b. Students will identify CT scans through the use of pixels.

FF. *Materials*

1. enlarged copy of CT scan (see Appendix E)
2. grayscale handouts (see Appendix F)
3. paper
4. rulers
5. colored pencils

GG. *Key Vocabulary*

1. CT scan: an image produced by scanning
2. grayscale: composed of (discrete) shades of gray
3. pixel: the basic unit of the composition of an image on a television screen, computer monitor, or similar display
4. tumor: an abnormal growth of tissue resulting from uncontrolled, progressive multiplication of cells and serving no physiological function; a neoplasm

HH. *Procedures/Activities*

1. Students will identify through lecture the various waves used in the medical field to complete diagnostic tests, such as X-rays, MRIs and CT scans.
2. Students will create a drawing of a CT scanner using teacher notes in order to demonstrate that the scanner uses waves to create an image with grayscaled pixels.
3. Students will determine a gray (or color) scale and assign numbers to at least 4 values.
4. Student groups will each be given a different grayscale handout. The pixels on each are different dimensions. From the handout, students will recreate the CT image.
5. As a class, students will compare the various images created with different sizes of pixels. Students will identify the one with the most clarity and determine the body part and disease.
6. Students will summarize the importance of pixel size in a paragraph after viewing the enlarged original CT scan.

II. *Assessment/Evaluation*

1. summary

Lesson Eight: Landscape and the History of Photography

JJ. *Daily Objectives*

1. Concept Objective
 - a. Students will explore and understand the photographic techniques of the past.
 - b. Students will explore and understand current photographic processes and traditional applications.

- c. Students will explore and understand the photographic science of tomorrow.
 - d. Students will explore and understand how the photographic techniques of the past and the science of tomorrow are beautifully and artistically linked into translations of the common everyday objects of nature.
2. Lesson Content
- a. Photography: identifying leading photographers of the 20th century
 - b. Painting Since WWII: Jacob Lawrence
 - c. Technology: digital cameras and their workings
3. Skill Objectives
- a. Students will learn how to operate a digital camera and all of the photographic features that are available (such as cropping, zooming, etc.).
 - b. Students will take three pictures of landscape images which have been manipulated.
 - c. Students will scan images into a computer.
 - d. Students will further manipulate images to produce black and white photos as well as sepias.
 - e. Students will render the sepia prints with markers, water color paints and artist quality color pencils.

KK. *Materials*

- 1. digital camera (see Appendix G)
- 2. disks for cameras
- 3. markers
- 4. Prisma Colors
- 5. water color paints
- 6. brushes
- 7. water
- 8. water color paper (cut to size of printer)
- 9. containers for water color
- 10. access to a computer lab
- 11. color printer
- 12. scanner
- 13. scissors
- 14. glue or tape
- 15. mat board for mounting

LL. *Key Vocabulary*

- 1. Adams, Ansel: American photographer noted for his magnificent black-and-white photographs of the American wilderness
landscape: an expanse of scenery that can be seen in a single view
- 2. Lawrence, Jacob: American WPA painter whose works depicted the transfiguration of African Americans
- 3. lighting: the illumination derived from a source of light
- 4. portrait: a likeness of a person, especially one showing the face, that is created by a painter or photographer

5. series: a number of objects or events arranged or coming one after the other in succession

MM. Procedures/Activities

1. Students will view works by Ansel Adams, including *Moonrise*, and understand the concept of landscape photography.
2. Students will learn about Jacob Lawrence and how his *Migration of the Negro* series was a “portrait” that was a multiple of canvases and images.
3. Students will do a quick drawing of how to tell a story about a single object by using images instead of words.
4. Students will build a concept of how they could tell a visual story about a landscape using color and texture as the theme behind the story (i.e. seasons, symbolism of seasons, etc.).
5. Students will do a rough draft on drawing paper of how this “series” of images would look.
6. Students will take a field trip to an outdoor location which has several landscape qualities such as trees, large panoramic views and elements of nature (trees, etc.).
7. Each student will take three photos (three increases chances of at least one photograph being used) using the features on the camera to manipulate the images in terms of texture or light/dark contrast.
8. Students will further manipulate the image to include a sepia print and a textured black and white.
9. Students will print two versions of the original print: a color and a black and white.
10. Students will then print a sepia version of the original on water color paper that has been cut to fit the printer.
11. Student will use water colors, markers and Prisma colors to create one or more textured images of the original in sepia tones. This will visually demonstrate the history of photography.
12. Students will cut and mount these images onto mat board in the following order: black and white photograph, regular color image and then the single (multiples) of the manipulated sepia images.
13. Students will write a brief description of the transition in their visual series and what their concept is.

NN. Assessment/Evaluation

1. Students will write a personal critique of their work pointing out the strong elements of the work as well as the elements which were weak and any possible changes that could be made to enhance and develop the weak ones into strong ones.
2. Students will then take part in a group critique where the same criteria for the personal critique will be applies.

VI. CULMINATING ACTIVITY

- A. Students will install their works in a public arena such as a local museum, the main building for the school district or the children’s ward of the local hospital.

VII. HANDOUTS/WORKSHEETS

see Appendices

VIII. BIBLIOGRAPHY

Core Knowledge Sequence: Content Guidelines for Grades K-8. Charlottesville, VA: Core Knowledge Foundation, 1999, ISBN 1-890517-20-8

Giancoli, Douglas C. *Physics: Principles with Applications.* Upper Saddle River, New Jersey: Prentice Hall, 1998, ISBN 0-13-611971-9

Mittler, Gene A. *Art in Focus.* New York: Glencoe, 1994, ISBN 0-02-662312-9

O'Brien, Michael F. and Norman Sibley. *The Photographic Eye: Learning to See with a Camera.* Worcester, Massachusetts: Davis Publications, 1988, ISBN 0-87192-193-6

Appendix A

Names _____

Rubric for Photo Graphing and Enlarged Pixelation

	poor			excellent	
Accuracy of Grid	1	2	3	4	5
Exactness of Image	1	2	3	4	5
Contrast of Value Scale	1	2	3	4	5
Craftsmanship	1	2	3	4	5
Total	_____ x 5 = _____				

Appendix B

Names _____

Rubric for Group Collage

	poor			excellent		
Concept	1	2	3	4	5	
Craftsmanship	1	2	3	4	5	
Overall Appearance	1	2	3	4	5	
Group Collaboration	1	2	3	4	5	
Total	_____ x 5 = _____					

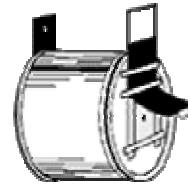


How to Make and Use a Pinhole Camera

Can Or Box Pinhole Camera

When you make a pinhole camera to accept roll or sheet film, use a small, light-tight can or box as the camera body.

You can use any can that has a tight-fitting top. A 2-pound coffee can makes a good pinhole camera. You can use a clean paint can, a vegetable shortening can, a peanut can, or even a cylindrical oatmeal box. If the can you use has a plastic lid, you can paint the lid black. Be sure to paint it inside and out; then before using it, check to make sure no paint has chipped off. Chipped or peeling paint on the lid will allow light to enter the camera and ruin your pictures.



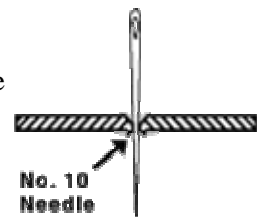
Pinhole camera made from a can.

Paint the inside of the camera body with dull black paint or line it with black paper to prevent light reflections.

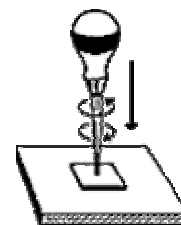
The Pinhole

With a noncartridge camera, make the pinhole in the end opposite the removable end. It's easier to attach the film to the removable end. You can make the pinhole in the box or the can itself, but it's much easier to make it in a separate piece of heavy black paper or thin metal. Then fasten this piece over a larger hole cut in the center of the permanent end of the can or box. Heavy-duty aluminum foil or the backing paper from Kodak roll film is good for this purpose.

For a camera with the pinhole 3 to 6 inches from the film, you'll get the best results if the pinhole is about $1/75$ inch in diameter. You can make a hole this size by pushing a No. 10 sewing needle through the paper or metal to a point halfway up the needle shank. See illustration. You'll get a smoother hole if you rotate the needle as you push it through. If you're using aluminum foil or paper, sandwich it between two lightweight cards while you make the pinhole. This will help you make a smoother, rounder hole.



You can also make a good pinhole in soft aluminum sheet metal. Place the aluminum on a hard surface (such as tempered hardboard). Make a small hole in the aluminum with an awl or an ice pick. Don't press too hard--the tip should just barely break through the surface. See illustration. The hole will be ragged. Enlarge and smooth it by pushing a No. 10 needle into it from the indented side. You can smooth the rough edges with very fine sandpaper and then open the hole with the tip of the needle. You can use the same method to make the pinhole directly in the metal of the can by working the hole through from inside the bottom of the can.



If you make the pinhole in a separate piece of black paper or metal, you should now make a hole $1/4$ inch or more in diameter in the center of one end of the camera body. Then tape your pinhole in position over the center of the hole.

Appendix C

You can check your pinhole to make sure it's perfectly round by looking through the back of the camera. To see if the image is clearly visible, aim the camera toward a printed page to determine if you can see the letters clearly.

The Shutter and Viewfinder

The shutter for the camera can be a flap of opaque dark paper hinged with a piece of tape. You can use a small piece of tape to hold the shutter closed while you aren't taking a picture.

A viewfinder for a pinhole camera, while usually not necessary, can be made of cardboard or wire. The larger frame should be slightly smaller than the film size and located directly above the pinhole at the front of the camera. If the film isn't square, the viewfinder should have its longer dimension parallel to the longer dimension of the film. The small frame is a sighting peephole directly above the film and squarely behind the center of the large frame.

When you aim your camera at subjects closer than 5 feet, tip the camera up slightly to allow for parallax--the difference between the view you see through the viewfinder and the image recorded on the film. This effect is caused by the separation between the viewfinder and the pinhole.

Loading a Can or Box Pinhole Camera

You can load the camera either with film or fast photographic paper. Paper is easier to handle since you can load it into the camera under a safelight. If you don't have a safelight, you can work by the light of a flashlight covered with several thicknesses of red cellophane paper placed 6 to 8 feet away. Most film, on the other hand, must be handled in total darkness. Your choice of film or paper may depend in part on the exposure times. Paper, because it is less sensitive to light than film, will probably require an exposure of about 2 minutes for sunlit subjects. Film may require only 1 or 2 seconds for subjects in sunlight.

If you decide to use paper, try KODABROMIDE Paper F (glossy), No. 2, Single Weight. You can obtain this paper in the 4 x 5-inch size available in 100-sheet packages, or 5 x 7-inch size in 25-sheet packages from your photo dealer (corners may have to be trimmed to fit a cylindrical camera). If you use film, you can cut up a roll of KODAK TRI-X Pan Film or KODAK T-MAX 400 Professional Film, 120 size, into 2 3/8-inch squares or 2 3/8 x 3 1/2-inch pieces. This must be done in total darkness, of course. At night a closet will probably be dark enough if lights in adjoining rooms are turned off. Sheet film, such as KODAK Tri-X Pan Professional Film, is easier to use because it's flat.

A camera made from a 2-pound coffee can will take a 2 1/4 x 3 1/4-inch piece of film or photographic paper. You can use a 3 1/4 x 4 1/4-inch piece if about 1/2 inch is clipped from each corner of the film or paper. A camera made from a 1-gallon paint can will take a 4 x 5-inch piece of film or paper.

When you have the size of paper or film you need, tape it firmly to the inside of the end of your camera opposite the pinhole. The emulsion should face the pinhole. The emulsion side of photographic paper is the shiny side. The emulsion on roll film is on the inside of the curl. Sheet film is identified by notches cut into one of the shorter sides. When you hold the film in a vertical position with the notches in the top edge toward the right side, the emulsion is facing you. Another way to determine the emulsion side of either paper or film is to touch both sides with a moistened finger. The emulsion side will feel slightly

Appendix C

tacky. Test near the edge to avoid a fingerprint in the center of the picture. You will need to tape down the four corners if you use cut-up roll film or paper. Taping two diagonal corners will work for sheet film. Close the camera, making sure the shutter is closed.

Exposure

To get clear, sharp pictures, you must keep your camera very still while the shutter is open. Use tape or a lump of modeling clay to hold your camera to a table, windowsill, chair, rock, or other firm support. Lift the black paper to uncover the pinhole and keep the pinhole uncovered for the recommended time. Cover the pinhole with the black paper between exposures.

The following table gives exposure recommendations for a can or box pinhole camera. These recommendations are approximate. It's a good idea to make three different exposures for each scene, as explained above, to be sure you'll get a good picture.

KODAK Film or Paper	Bright Sun	Cloudy Bright
TRI-X Pan, T-MAX 400, or ROYAL Pan Film 4141 (ESTAR Thick Base)	1 or 2 seconds	4 to 8 seconds
T-MAX 100 Film	2 to 4 seconds	8 to 16 seconds
KODABROMIDE Paper, F2	2 minutes	8 minutes

Processing and Printing

Print film negatives in the usual way. If you use KODABROMIDE Paper to make your picture, make the camera exposure long enough to allow the resulting paper negative to be a little darker than an ordinary photographic print. Dry the paper negative and make a contact print from it in the normal way, with the emulsion (picture) side of the paper negative toward the emulsion (shiny) side of the printing paper.

Kodak, Kodabromide, Royal, T-Max, and Tri-X are trademarks.

Appendix D

Names _____

Rubric for Polaroid Lesson Plan

	poor				excellent					
Accurate Information	2	3	4	5	6	7	8	9	10	
Lesson for Younger Students	1		2		3		4		5	
Presentation of Lesson	1		2		3		4		5	
Group Collaboration	1		2		3		4		5	
Total	_____ x 4 = _____									

Appendix E

Appendix F

Names _____

color scale

1	2	3	4	5

CT re-creation

with $1/2 \text{ in}^2$ pixels

5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	4
3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
3	1	3	3	3	4	3	3	1	3	3	3	3	3	3	3	3
1	1	3	3	4	4	4	1	3	1	4	4	4	3	3	3	3
3	3	3	4	4	4	4	1	1	4	5	4	4	4	3	3	3
3	3	3	4	4	4	4	5	4	3	2	2	4	4	3	3	3
3	3	1	3	4	4	4	3	5	4	2	2	4	3	3	3	3
3	3	3	3	3	3	3	3	3	3	2	3	3	3	3	3	3
3	3	3	3	3	3	1	3	3	3	1	3	3	3	3	3	3
5	5	5	5	5	5	3	3	3	3	3	3	5	5	5	5	5

OR

with 1 in^2 pixels

3	3	3	3	3	3	3	3	4
3	3	4	3	3	3	3	3	3
3	3	4	4	3	4	4	3	3
3	3	4	3	3	2	3	3	3
5	5	3	3	3	3	3	3	3

OR

with 2 in^2 pixels

3	3	3	3
3	4	3	3
5	3	3	3

OR

with 3 in^2 pixels

3	3	3
3	3	3

Appendix G

How to take a picture using the Sony Mavica camera

1. Insert a floppy disk as indicated below.
2. Turn on the camera by pressing in the green button and sliding the whole switch down.
3. Ensure that the selection switch is in the 'CAMERA' (STILL on the FD81) position.
4. Ensure that the auto focus is switched on (or switch onto manual focus and rotate the ring around the lens to focus).

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5. Slide the zoom button left or right to zoom into the object being photographed.

6. When you are happy with the image on the screen take the picture by pressing the shutter button on the top of the camera. The image will be recorded onto the floppy disk in JPEG format.

7. To view the images you have taken slide the selection switch onto 'PLAY'

The screen should look like this:

8. Press the up arrow on the navigation button (shown below) so that the left or right arrow is highlighted in the bottom left corner of the screen. Now press in the whole of the navigation button and the pictures you have taken will be displayed in order.

Appendix G

10) If you want to delete a particular photo, highlight MENU using the navigation button and press it in.

Using the up arrow on the navigation button, highlight DELETE and press the navigation button in. Now select OK in the same way. The current displayed picture will be deleted.

Advanced Features

Below are some of the advanced features of the Sony Mavica camera. Menu Options

Appendix G

In the bottom left hand corner of the CAMERA/STILL display there is a MENU icon. Use the navigation button to highlight it, then press in the navigation button.

A list of operations will appear which can be accessed by using the up arrow on the navigation button. The operations are as follows:

Use this mode to select the image quality:

Flash Level

There are three levels of flash, HIGH, NORMAL and LOW. These should be used in conjunction with the flash button below.

Flash Button

By pressing the flash button there are three settings. A symbol will appear at the top of the screen and the light in the centre of the button will either be on or off depending on the setting.

When this symbol is showing there will be no flash, and the light in the button will be off.

Depending on the flash level one of the following symbols will appear

Appendix G

Low Flash

Normal Flash

High Flash

If there is no symbol on screen, but the light in the button is still on, the flash is set to auto and the level will be set by the brightness of the surroundings.

E.g if the surroundings are dark the flash level will be high, if the surroundings are very light i.e. bright sun, there

Beep

BEEP Beep will allow you to turn the sound the camera makes when you press a button or take a picture ON or

Picture Effects

The Mavica cameras have in built Picture effects. To access these press the above button. With each press of the button the following effects will be displayed on the screen. If no effect is displayed the setting is normal.

Appendix G

EFFECT	DESCRIPTION
NEG. ART (Negative Art)	This effect will change the colours from black to white and vice-versa.
SEPIA	This will give an old fashioned photograph effect.
B&W (Black & White)	This will take the picture in balck and white.
SOLARIZE	This effect increases the light intensity and makes the picture look like an illustration.

Exposure Settings

Automatic Exposure Settings

The Sony Mavica camera has six automatic exposure settings which can be selected by pressing the Program AE button.

On each press of the AE button, one of the following symbols will appear in the top left hand corner of the screen. If no symbol is displayed, the setting is normal.

Portrait mode. Use this setting when taking pictures of people.

Sports mode. Use this setting when taking pictures of fast moving objects.

Beach mode. Use this setting when taking pictures in strong light or reflected light.

Sunset mode. Use this setting when taking pictures in dark environments.

Landscape mode. Use the setting when taking pictures of distant objects.

Panfocus mode. Use this setting when taking pictures of close or distant objects quickly and easily or where focusing is difficult due to lack of light.