Seeing Printmaking in a New Light: Cyanotype Printing

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This curriculum unit is recommended for:
9th-12th Grade Beginning Visual Arts and
Beginning Contemporary Crafts and Design

Keywords: cyanotype printmaking, photography, elements of art, principles of design, composition, exposure,

Teaching Standards: See Appendix 1 for teaching standards addressed in this unit.

Synopsis: This curriculum unit introduces the early scientific fundamentals of photography to my 9th - 12th grade students. It introduces students to the intersection of Art and Science. I will accomplish this by teaching students the cyanotype process.

The lesson will begin with a brief history lesson on chemist Sir John Hershel and his botanist friend, Anna Atkins. Sir John Hershel discovered the cyanotype process in the late 1700's. Anna Atkins used his cyanotype process to illustrate a variety of plant life.

Once students are grounded in the history of the cyanotype process, they will create their own cyanotype. We will then exhibit their work in an art exhibition at Garinger High School.

I plan to teach this unit during the coming year to 90 students in 9-12 grade.

I give permission for the Institute to publish my curriculum unit and synopsis in print and online. I understand that I will be credited as the author of my work

Introduction

I envision my students pondering: “One guy has a paint pallet, while the other wears a white coat, and mixes explosives. How is she going to show me any type of correlation between these two people? This is dumb!”

I will start the lesson by introducing cyanotype as an antique photographic printing process that is distinctive for producing Prussian blue monochromatic prints. The objective of this unit is for beginning visual art students in grades 9-12 to gain an understanding of the history and process of cyanotype printing that was used in the late 1700’s. The process will involve students using a digital camera to capture an image of a special moment, or of an object, that has significant value to them. The digital negative will be produced by printing the image onto transparent film using an ink jet printer. The developmental process of cyanotype printing involves placing the digital negative on top of a piece of paper that has been coated with a mixture of two primary chemicals, ferric ammonium citrate and potassium ferricyanide. This mixture, when applied to watercolor paper makes the paper sensitive to light. Students will not combine these chemical themselves. Instead, they will use a commercially produced, light sensitive paper. They will take the transparent film, lay it on top of the light sensitive paper, cover it with a sheet of glass, and expose it to sunlight. The sunlight will develop it. The image on film will transfer to the paper. Chemicals make the paper become light sensitive, and create the color (Prussian blue - cyanide). The chemically treated light sensitive paper and its’ exposure to direct sunlight connects the two respective disciplines, which will in turn stimulate discussions about the chemistry behind different mediums used in art.

Rationale

What does an artist and chemistry have in common? Albert Einstein said, "The greatest scientists are artists as well,"(Calaprice, 2000, 245). [i]
“Art and science may seem an unlikely pair, but in fact the sciences have been the subject of artists for centuries. The Institute collects these works, specifically as they correspond to the history of chemistry, alchemy, and other chemistry-related activities. Such artworks appear in a variety of media, including oil paintings and portraits, prints, sculpture, multimedia works, and contemporary and nontraditional media. The Institute’s fine-art holdings are eclectic but nonetheless have considerable strength and depth in the area of art depicting early modern chemists and alchemists from the 17th to the 19th century.”[ii]

It is a rarity that students are taking visual arts because they are interested in art or will pursue art as a career. Rather, they are there for reasons such as “my guidance counselor put me here”, or “I was not able to get early release and I heard this is an easy grade.” This unit will present art on a more level playing field, especially for those who have preconceived notions that the visual arts are only for people who draw well. Most people are guilty of biases such as these because they fail to understand that they actually come to visual arts class to learn something new.

By developing this curriculum course, my students will be introduced to and explore a historical printmaking technique that was discovered by Sir John Herschel (1792-1871) in 1842, three years after the invention of photography. My high school students will be able to explain that cyanotype is an inexpensive method of reproducing photographs and other documents. Some examples include maps and architectural plans, also known as, "blue prints". Student will explain how the chemically treated, light sensitive paper and its exposure to direct sunlight connect art, chemistry, and the cyanotype photographic process.

Students will view cyanotype prints created by Anna Atkins, who used Herschel's cyanotype invention to document images of algae, ferns, feathers and waterweeds. Atkins made thirteen known versions of her works titled, British Algae: Cyanotype Impressions (1843-1953). This substantial body of work noted her as the first woman photographer. Atkins and her father John George Children were both botanists living in Kent England, not far from Herschel, who was a friend of the family.[iii] Students will add a modern twist to Herschel's historic photographic printing process by using a digital camera or cell phone. Students will use a digital camera or cell phone to photograph people, places and things that are interesting to them. The images will be printed onto a transparent film that will be used as a digital film negative. The film negative will be placed on top of light sensitive paper, covered with a sheet of glass, and exposed to direct sunlight. The cyanotype will be developed so that one can see what it looks like using water. The final prints will be displayed.

School/Students Demographics

Garinger High School is the oldest operating high school in the Mecklenburg school district. It is located on the east side of Charlotte, North Carolina. According to the Rambler, an online newspaper, its unique architecture was featured in National Geographic Magazine in 1962. The demographic for the 2017-2018 school year lists 1,762 students enrolled and 118 teachers employed. The school population consists of: Hispanic 33.3%, Afrcan American 20.8 %, Asian 31.5%, and White 37.7%. Students have various backgrounds, and come from all over the world. Students from 44 countries, speaking 28 different languages, attend Garinger High School. Currently, 50% are bilingual, 29.2% are English learners and 191 students have been in the U.S. for less than two years. The economic profile and demographic makeup of the campus and surrounding community has changed markedly over the past 40 years.[iv]

I am currently teaching Beginning Visual Art and Beginning Contemporary Crafts & Design for grades 9-12 at Garinger High School. Our High School Visual Arts courses are grounded in the North Carolina Essential Standards, and the NC Standard Course of Study. These courses are consecutively organized by four proficiency levels - Beginning, Intermediate, Proficient, and Advanced. The Essential Standards are comprised of three strands of artistic learning: Visual Literacy, Contextual Relevancy and Critical Response. There are clarifying objectives for each of the standards that indicate what students should know and be able to master before progressing to the next level. Classes are 90-minute blocks that are taught for an entire semester. There are 25-30 students listed on my roster. My students are unique individuals, possessing all levels of abilities, including English Language Learners, Exceptional Children, and Students with Special Needs. Lesson plans include modifications for all students.

Unit Objectives

According to the North Carolina standard course of study, high school students should know and be able to understand the interdisciplinary connections and the life applications of the visual arts. They will understand that art is more than just a source of enjoyment, but also a skill that can advance their professional endeavors. There are four visual arts teachers including myself at Garinger High School who will be able to utilize this unit. The visual arts classes include Beginning, and Proficient Visual Arts I, Beginning and Intermediate Contemporary Crafts and Design, Beginning and Proficient Ceramics and AP Studio Art.

When I plan an Art Lesson, I determine exactly what I want the students to learn by using a Student Learning Map. This information goes under the "Key Learning" section. Once I have determined this, I develop the Unit Essential Question. I then break down the Unit Essential Question into concepts that I want the students to master. From those concepts, I develop my daily Lesson Essential Questions, and the content vocabulary that will be needed.

Once these steps are complete, I plan my Activating Strategies, my Teaching Strategies, and the Art Project that we will be completing. Once I have those planned, I create my Summarizing Strategies, which include an oral summarization (numbered heads), a visual/artistic summarization (project), a writing summarization (reflection) and a written test.

When I introduce a Unit, we record the AHA Connection question, which is the "big idea" that students should be able to answer by the end of the unit. This is recorded in the students' Interactive Notebooks. This is NOT a daily essential question. This is the "BIG IDEA" for the entire unit. A Unit in Art 1 can last up to a week or more. We answer this in our notebooks when the unit is completed.

The Art 1 curriculum is based on the Elements of Art and the Principles of Design, also called the "Language of Art". When I introduce a new Unit, I have the Unit and Project Title; the "I Can" statements, and the Project Criteria on the board. I begin by introducing the Art Vocabulary that we will be using for the Unit. Students record this information in their Interactive notebooks on the Unit Title Page. I then present a PowerPoint on the information to be learned. Students record notes in their interactive notebooks. During the presentation, we stop approximately every 15 minutes and "chunk" the information. Students are paired and required to tell the information to their partners. After the PowerPoint presentation, I review the vocabulary, while creating a graphic organizer on the board. I then review the steps needed to apply the information learned to the actual art project that we will be creating.

I have student samples of the project we will be completing on display, ranging from an "A" to a "C". These are discussed and "critiqued" so students understand what is expected of them; what makes an excellent work; and what makes a work "average". Students create their own graphic organizers for the unit on the "Student Output" page in their interactive notebooks. In addition to graphic organizers, students may create poems, songs, samples of the Element/Principle, etc. Once I establish that learning has taken place, students apply the knowledge learned by creating an art project.

Content Research

Our CTI seminar leader, Chemist Professor Tom Schmedake presented chemistry in such an engaging way. He used visuals, demonstrations, and hands on activities that made me look forward to each class, even though I was tired from working all day. I could not wait to discover what we would be learning the next time class met. I have a lot of information that I gleaned from his seminar that I intend to share with my students. Our seminar theme is "light", and we will discuss what light means from both an artistic and a scientific perspective. The scientific approach includes measuring the speed of light. Schmedake demonstrated this with a microwave, a chocolate bar, and a ruler, immediately after he taught the mathematical equation. In his seminar, we learned and applied the chemical formula to create sparkles. The kind that we see during July fireworks. The most beautiful, colorful flames I have ever seen were made from mixing chemicals. In the seminar, we filmed ourselves putting helium inside balloons w/chemicals, and watched it make a colorful explosion. Wet hands and a bit of petroleum made a very interesting photograph of me holding a flickering flame of fire. The flickering flame lasted only a short while, and I was surprised that I could not feel any heat from it. The grand finale was observing thermite that Schmedake mixed, and its reaction to heat. The molten iron it made after a brief burst of heat resembled an explosion. This seminar has provided me with a lot of information that I plan to share in my classroom. It will immerse my students with information about chemicals that artists use in the process of making art. It will also integrate art with other disciplines.

I have selected Constanza Isaza Martinez as my contemporary cyanotype artist. She is a photographer, researcher, curator and educator based in London England. She received her BA in Photographic Arts from the University of Westminster in 2007, and her MA in History of Art from the Courtauld Institute in 2012. She co-owns Lux Darkroom, where she teaches historical photographic processes. Her work is inspiration by historical nineteenth-century photography and photographic printing techniques. She works uses various types of photographic techniques including the cyanotype photographic process.

"The process produces striking Prussian blue images which can be toned in various colors, but despite its simplicity and low cost, it has never been widely used as processes with a broader tonal range such as the salt print. However, it remained in use well into the twentieth century as a means of reproduction: architectural, blueprints, for example, were made with cyanotype chemistry. In more recent times, the cyanotype has been rediscovered by contemporary artist an explored in relation to its historical context as well as the expressive possibilities it offers."[vvi]

"They explore the expressive potential of photography, focusing on the surface of the print rather than the picture beyond or behind this surface, and paring down the medium to its most essential components: light and chemistry."[vii]
MATERIAL LIGHT is an exhibition of contemporary and historical works which examine the material nature of the photographic image. The exhibition was first shown at the University of Westminster in London in December 2013, and then at the Belgrade Cultural Centre in Serbia. The list of artists (on the left) includes all the artists who have been a part of Material Light. For a list of those exhibiting in Belgrade please see the Belgrade page on this site, and those at Kochi the Kochi page.[viii]

Instructional Implementation

Teaching Strategies

Turn and Talk is defined as an oral language support strategy that provides students with scaffolded interactions to formulate ideas and share their thinking with another student. When Turn and Talk is used, all students have a chance to share their thinking in a low-risk setting. Verbalizing their thinking scaffolds the students' understanding and provides talk at a peer level, a model close to the language the student controls. [ix]

Anchor charts are defined as containing key elements of what is being taught, and should be hung up in the classroom for students to refer to. The list of indicators on the anchor chart should be reflective of the skills of the students in your classroom and reflect what you have modeled for students. This list may grow over time as you add new skills. For example: after we have taught students to prompt their partner to say more, we could then add that to the anchor chart.[x]

Rubrics are a useful scoring tool that list criteria and the expectation for the projects.

Reflection - At the end of the Unit, the students are required to write a reflection about the project they created. This reflection must be at least 4 paragraphs, and must follow the Art Criticism guidelines of 1) Describe, 2) Analyze, 3) Interpret, 4) Judgment. By following these guidelines, students must use appropriate art terminology to describe their feelings about their work. They evaluate their own art in terms of its weaknesses and merits. They are critical of their work and of the media and processes they are using. Students use this self-critiquing to improve the quality of their art. Students make judgments about art and defend their judgments based on knowledge and reflective inquiry. This is one of the Essential Standards for Art 1. In doing this, students learn to "speak" the language of art.

Lesson 1 - Breif History of Cyanotype Process

Introduction: Students will view a video introducing them to the Cyanotype Process. A PowerPoint presentation will be presented containing information that the student will learn. We will stop about every 15 minutes to chunk information in their interactive notebooks. The Project Title for the Unit, the "I can" statement(s), the Project Criteria, and the Art Vocabulary, are recorded in their notebooks. They will include notes taken from the video about Hershel and Adkins, and a definition of "cyanotype" will be included in their notebooks. Students will be paired with others at their table and will be required to take turns discussing the information with their partners. After the PowerPoint presentation, I will review the vocabulary while creating a graphic organizer on the promethium board.

Lesson Essential Question(s): What is the cyanotype process? Who is Sir John Herschel? Who is Ana Adkins?

Vocabulary: printmaking, cyanotype printing, tonal range, mid tones, shadow, positive and negative space, composition

Art Project: Lesson Essential Question(s): What is positive and negative space? Does negative space have shape? Vocabulary: positive and negative space.
Art Project: Students will identify positive and negative spaces in two dimensional works of art. Students will be able to explain the negative space in terms of size, shape, and relationship to positive space. Students will select an image from a magazine (a person or object that they find interesting). They will place a sheet of tracing paper over the image and trace it. Using a pencil, they will darken the negative spaces and leave the positive spaces white. Students will then repeat this process on another sheet of paper, this time darkening in the positive spaces and leaving the negative spaces white. When students have gained an understanding of positive/negative space, they will then create a new, detailed drawing with focus on positive and negative space. When the drawing is complete, they will transfer this image onto a Styrofoam plate, by incising the lines with a dull point such as a ball point pen or pencil. Using a brayer, students will coat the Styrofoam printing plate with ink. Students will cover the inked plate with paper and use a spoon or fingertips to rub the entire paper in a circular motion. They will gently "pull" the print, separating the paper from the Styrofoam plate. Students will create a series of 3 prints.

Students will write a reflection in their interactive notebook on the process and success of their prints. They should be able to discuss positive and negative space in their reflections.

Lesson Overview Day 2

Lesson 2- Online Editing

Introduction: Students will view a video introducing a Brief History of Photography, and how to use the editing software Picasa.[xi]
A PowerPoint presentation will be presented with information the students will learn. Students will chunk and record information in their interactive notebooks. The Project title, "I can" statement(s), Project Criteria, and Art Vocabulary will be recorded as well. Students will be paired with others at their tables and required to take turns discussing the information with their partners. After the PowerPoint, we will review the vocabulary, while creating a graphic organizer on the promethium board.

Vocabulary: Crop, Size, Rotate, Filters,

Essential Question: How can editing tools change the content and context of a photograph?

Art Project: Students will work in pairs using a digital camera or their cell phones to capture images of people, places and things that are interesting to them. Students will use the rule of thirds, and the elements and principles of art to create a good composition. Students will download their images onto their computers. They will use Picasa (a free online editing tool provided by Google) to crop, size and enhance their photographs. When finished, they will write a reflection requiring them to do the following: Cut out your favorite image that you have cropped. Paste it into your interactive notebook, and add notes about the original. Discuss how you manipulated the context of the photograph through cropping and editing.

Students will print their final photograph onto a transparent film that will become the digital film negative. They will place the film negative on top of pre-treated light sensitive paper, covered with a sheet of glass and held together with clamps. This will be exposed to direct sunlight for approximately 10-15 minutes. The exposure will turn the paper a dark Prussian Blue. Students will pull the print from the glass and develop it by placing it under running water. When clean, it will be placed in a developing bath (tub filled with water). They will gently agitate the print and watch the photograph slowly appear. The prints should contain a range of values that consist of white highlights, mid-tones, light blue and dark blue shadows. The print will be pulled from the bath before the Blues starts to fade.

Lesson 3 - Art Criticism

Lesson Essential Question: What are the four steps of Art Criticism?

Vocabulary: Elements of Art, Principles of Design, Describe, Analyze, Interpret, Judge

Teaching Strategies: Students will analyze an image by working in small groups. Students will look closely at a photograph that will be on display in the classroom entitled *Lincolnon Battlefield of Antietam, Maryland*. [xii] A Power Point presentation explaining the four parts of art criticism will be shown. Handouts on the Elements of Art and Principles of Design will be provided, helping students to comprehend the art vocabulary and concepts. Students will be guided through the Art Criticism process by applying each of the four components of Art Criticism to the photograph.

Art Project: Students will write an objective, descriptive response showing what they see in the photograph. Students will turn and share their responses with their table partners. Discussions should include how the picture makes one feel. What reaction does the photographer intend for the viewer to have? How does the background information on the photograph affect their interpretation of the image? Students will write their responses before sharing it with the group. Students will reflect on the photographs that they have taken of images they found interesting. They will refer to the handouts provided, and use them to analyze their own photographs using the four steps of Art Criticism. Each of their images may not contain all the elements and principles of art. Some will be more dominate than others. They will choose 3 elements of art and 3 principles of design to give a written response about where and how each appears in their photograph. They will "Turn and talk" to share answers with their group.

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Appendix 1: Teaching Standards

NC Essential Art Standards

B.CX.2.2 Recognize the interdisciplinary knowledge used in the creation of art.

B.V.1.2 Apply the Elements of Art and Principles of Design to create art.

B.V.2.1 Understand the role of planning in solving artistic problems.

B.V.2 Apply creative and critical thinking skills to artistic expression.

B.V.2.3 Create personal, symbolic expression as a means of communication (original, visual language).

B.V.3.1 Understand the appropriate and safe use of tools, media, and equipment.

B.V.3.2 Use a variety of media, including 2-D, 3-D, and digital, to produce art.

B.V.3.3 Exemplify characteristics of different artistic processes.

B.CX.1.2 Explain how art influences historical perspectives on society.

B.CX.1.3 Understand how art is used to document human experience
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B.CX.1 Understand the global, historical, societal, and cultural contexts of the visual arts.

B.CX.2.3 Analyze the collaborative process in the creation of art.

B.CX.2 Understand the interdisciplinary connections and life applications of the visual arts.

B.CX.2.4 Analyze the role of art in creating digital images, technological products, and design.

NC Essential Chemistry Standards

Chm.1.2.2 Infer the type of bond and chemical formula formed between atoms

Chm. 2.1.1 Explain the energy content of a chemical reaction

Chm.2.2.2 Analyze the evidence of chemical change.

Chm.3.2. Understand solutions and the solution process

Chm 2.2.3 Analyze the law of conservation of matter and how it applies to various types of chemical equations (synthesis, decomposition, single replacement, double replacement, and combustion)

Appendix II

Key Learning: Understand the history and process of cyanotype printing. Apply the elements of art/principles of design when executing basic photographic skills. Understand the chemical formula used to make paper become light sensitive.

What is Cyanotype printing and how is it made?

Concept:	Concept:	Concept:
Brief History of English Chemist Sir John Herschel, who discovered the cyanotype printing process. Ana Adkins used the process to create a book that documented plants.	Basic Photography/Composition Skills Online Editing	Analyzing images using the Art Criticism Process Written response that demonstrate an understanding of using Art Criticism Process to analyze images.
Lesson Essential Questions: • Who was Sir John Herschel? • Who was Ana Adkins? • What does a Cyanotype Print look like? • What is the purpose of Cyanotype?	**Lesson Essential Questions:** • How does a digital camera work? • What is the rule of thirds? • How are the elements of art/principles of design used in photography to create a good composition? • How can you manipulate a photograph using Picasa editing software?	**Lesson Essential Questions:** • What is Art Criticism? • What are the four steps to Art Criticism?
Vocabulary: • Cyanotype Printing • Prussian Blue • Sir John Herschel • Ana Adkins	**Vocabulary:** • Composition • Elements of Art and Principles of Design • Positive & Negative Space • Cropping • Sizing • Filters • Sharpen • Rotate	**Vocabulary:** • Describe • Analyze • Interpret • Judge • Elements Art • Principles of Design

Additional Information/Resources:
Art in Chemistry, Chemistry in Art[xiii]
Digital Photography, A New Introduction[xiv]
https://www.youtube.com/watch?v=TJGQ6Ync1a4&t=56s Cyanotype my first Attempt
https://www.youtube.com/watch?v=y00DU5OOqaQ
[xv] Cyanotype Tutorial
https://www.youtube.com/watch?v=fSSOZxLnNyc[xvi] Rule of thirds
https://www.brainpop.com/ Brain Pop camera/photography
https://www.youtube.com/watch?v=rskC6c_5L1M [xvii] Introducing Picasa
https://www.youtube.com/watch?v=Hv1QjUrDfmY [xviii]
analyzing art ted talk

Appendix III

Art Criticism

Art criticism involves a specific way of looking at a work of art. You can make discernment about art without being a professional artist. All you need to do is learn to look (see) and think about what you are seeing.

Learning how to criticize artwork properly will allow you to better understand works of art and why they have become important.

The process of art criticism involves 4 actions. They are: describe, analyze, interpret and judgment.

Some guidelines to help you are below:

Describe – Give a description of the artwork. Size, medium, and process (found in the credit line). The subject and objects in the work. What things are in the painting? Think of things like clothing, environment, etc. Tell what you see.

Analyze – This will be 2 paragraphs. Explain how the artist organized the work. How are the elements of line, shape, form, texture, space and value used? Choose 3 elements and write a paragraph about them. How are the principles of unity pattern, rhythm, variety, balance, emphasis and proportion used? Choose 3 principles and write a paragraph about them.

Interpret – Explain the mood or meaning of the work. What is the artist trying to say to you? What is going on in the picture or artwork? Why did Mrs. Strickland assign this project? What do you think she wanted you to learn? Justify your answer!

Judgment – You make a judgment on whether or not the work is successful based on 1 of 3 aesthetic views. What do I think about this artwork? Do I like it? Why or why not? How do I feel about it? Was the artist was successful in conveying an idea? To better understand in deciding about how you feel about an artwork, it may help to take a look at the three common aesthetic theories below.

Is the artwork successful because:

Imitationalism/Realism – ***Subject:*** The artist rendered the images in a realistic manner. It is easy to discern the subject because of the realistic quality of the art.

Formalism/Composition - ***Composition:*** The artist was adept in using the elements and principles of design in the artwork. (This also refers to the placement, contrast, and interaction of all parts of the work.)

Emotionalism/Feelings – ***Content:*** The artist did a good job of evoking an emotion or feeling from me. The artwork is successful if it creates a strong mood or feeling.

Appendix IV

Art 1 Study Guide

Art is the special expression of ideas, feelings, and values in perceptible form. If something is perceptible, it means that we are able to perceive it.
To Perceive means to be aware of things through our senses, and to have the ability to recognize and understand things we experience in our environment.

Expressive means conveying or communication feelings and ideas in visual form.

The Elements of Art are basic visual symbols in the language of art. The elements of art are Line, Shape, Color, Value, Form, Texture, Space.

Line: There are 5 kinds of lines: Vertical, Horizontal, Diagonal, Curved & Zigzag. 2 of these lines show no movement….Horizontal and Vertical. 3 of these lines show action……Diagonal, Curved and Zigzag. The line that shows the most action is the Zigzag line. An Implied Line is a series of dots or dashes that the viewer's eyes automatically connect.

Shape: A Two-Dimensional are that is defined in some way. A shape has only Heighth and Width. There are 2 kinds of shapes: Geometric and Organic.

Color: An element of art that is derived from reflected light. It is what the eye sees when light is reflected off an object. Color has 3 properties: Hue, Value, and Intensity.

Value: The art element that described the darkness or lightness of an object.

Form: Objects having Three Dimensions. A Form has heighth, width, and depth. Like shapes, forms can be either Geometric or Organic.

Texture: The way things feel, or look as though they might feel if touched. Real Texture is how something truly feels (petting a soft, silky cat). Implied Texture is how something looks as though it might feel, if it were real (A soft, silky cat in a painting).

Space: The distance between, around, above, below, and within things. There are 2 kinds of space in art….Positive Space and Negative Space. Positive Space is space that is full (shapes, forms). Negative space is space that is Empty (background).

The Principles of Design are rules that govern how artists organize the elements of art. The principles of design are Balance, Variety/Contrast, Harmony, Emphasis, Proportion, Movement, Pattern/Rhythm, and Unity.

Balance: This principle of design is concerned with equalizing visual elements in a work art. If a work of art has visual balance, the viewer feels that the elements have been arranged in a satisfying way. Visual imbalance makes the viewer feel that that the elements need to be rearranged. There are 3 types of balance in art. Symmetrical Balance is where the 2 halves of the artwork are mirror images of each other (like a face). Assymetrical Balance is where the two sides are different from each other but carry equal visual weight. Radial Balance occurs when objects in a work of art are positioned around a central point (like spokes on a wheel).

Variety/Contrast: Principles of design concerned with differences. Variety uses different lines, shapes, textures, colors, and other elements to create interest in a work of art. Contrast creates large differences between two things: for example, rough and smooth, or white and black.

Harmony: The principle of design that creates unity by stressing similarities of separate but related parts.

Emphasis: The principle of design that makes one part of a work stand out above the other parts.

Proportion: The principle of design concerned with the size relationships of one part to another.

Movement: The principle of art used to create the look and feeling of action and to guide the viewer's eye throughout the work of art. It is a way of combining visual elements to produce a sense of action or motion.

Rhythm / Pattern: The principles of art concerned with repeating an element to make a work seem active or to suggest vibration. A Pattern is a shape or design that repeats itself. A repeating pattern uses just one shape over and over (circle, circle, circle, etc.). An alternating pattern uses 2 or more shapes or designs that repeat themselves over and over (circle, square, circle, square, etc.). Rhythm creates a visual tempo or beat – often described as flowing, progressive, or jazzy.

Unity: Unity is the arrangement of elements and principles to create a feeling of completeness or wholeness in a work of art.

Color and the Color Wheel

Primary Colors: These are colors that cannot be made by mixing other colors. They are Red, Yellow, and Blue.

Secondary Colors: The secondary colors are made by mixing two primary colors equally with each other. They are Orange, Green, and Violet (purple).

Red + Yellow = Orange
Yellow + Blue = Green
Blue + Red + Violet

Intermediate / Tertiary Colors: These are made by mixing primary colors with secondary colors. They are Yellow-Green, Blue-Green, Blue-Violet, Red-Violet, Red-Orange, and Yellow-Orange.

Complimentary Colors: These are colors that compliment their opposite color. They are found directly across from each other on the color wheel.
Red & Green, Blue & Orange, Yellow & Violet

Analogous Colors: These are neighboring colors on the color wheel. Example: Blue & Blue-Green

Monochromatic Colors: This is the variation of a single color. Example: Navy Blue, Blue, Carolina Blue

Tint: White added to colors. Example – Carolina Blue

Shade: Black added to colors. Example – Navy Blue

Cool Colors: Greens, Blues, and Violets are cool colors. They remind us of cool places such water and ice.

Warm Colors: Yellows, Oranges, and Reds are warm colors. They're active and fiery.

Neutral Colors: Made by mixing Black and White, or mixing complimentary colors together. Examples: Grays, Browns, and Beiges

Triad : 3 colors that are evenly spaced on the color wheel.

Hue: A common name for a color.

Color Spectrum: A band of colors produced when light shines through a prism.

Color Wheel: A chart used to organize color.

End Notes

[i] "Fine Art," Science History Institute, May 31, 2016, https://www.sciencehistory.org/fine-art.
[ii] "What Would a CERN Scientist and an Artist Have in Common?," *Athens Science Festival* (blog), accessed November 15, 2018, http://www.athens-science-festival.gr/en/blog_en/%cf%84%ce%b9-%ce%ba%ce%bf%ce%b9%ce%bd%cf%8c-%ce%bc%cf%80%ce%bf%cf%81%ce%b5%ce%af-%ce%bd%ce%b1-%ce%ad%cf%87%ce%b5%ce%b9-%ce%ad%ce%bd%ce%b1%cf%82-%ce%b5%cf%80%ce%b9%cf%83%cf%84%ce%ae%ce%bc%ce%bf%ce%bd/.
[iii] "Chapter7-the-Cyanotype-Process.Pdf," accessed November 17, 2018, http://www.christopherjames-studio.com/docs/chapter7-the-cyanotype-process.pdf.
[iv] From Gs, "Garinger High School Improvement Team Membership," n.d., 27.
[v] "Constanza Isaza Martinez," accessed November 19, 2018, https://www.constanzaisaza.com/.
[vi] "Cyanotype | Constanza Isaza Martinez," accessed November 19, 2018, https://www.constanzaisaza.com/pages/cyanotype.
[vii] "Constanza Isaza Martinez."
[viii] "Home |," accessed November 19, 2018, http://www.materiallight.net/home-2/.
[ix] "9-12.Pdf," accessed November 4, 2018, http://www.dpi.state.nc.us/docs/curriculum/artsed/scos/new-standards/arts/visual/9-12.pdf.
[x] "9-12.Pdf."
[xi] Google, *Introducing Picasa 3*, accessed November 18, 2018, https://www.youtube.com/watch?v=rskC6c_5L1M.
[xii] "Exploring Photographs (Education at the Getty)," accessed November 18, 2018, https://www.getty.edu/education/teachers/classroom_resources/curricula/exploring_photographs/background1.html.
[xiii] Barbara R. Greenberg and Dianne Patterson, *Art in Chemistry, Chemistry in Art* (Intellect Books, 1998).
[xiv] "Digital Photography: A New Introduction," Thames & Hudson USA, accessed November 15, 2018, https://www.thamesandhudsonusa.com/books/digital-photography-a-new-introduction-softcover.
[xv] Mike Browne, *The Rule Of Thirds*, accessed November 18, 2018, https://www.youtube.com/watch?v=fSSOZxLnNyc.

[xvi] Mike Browne, *The Rule Of Thirds*, accessed November 18, 2018, https://www.youtube.com/watch?v=fSSOZxLnNyc.
[xvii] Google, *Introducing Picasa 3*.
[xviii] "In the Eye of the Camera, 1840-1867," accessed November 18, 2018, http://collections.musee-mccord.qc.ca/scripts/printtour.php?tourID=VQ_P1_1_EN&Lang=1.

Bibliography

"9-12.Pdf." Accessed November 4, 2018. http://www.dpi.state.nc.us/docs/curriculum/artsed/scos/new-standards/arts/visual/9-12.pdf.

"Chapter7-the-Cyanotype-Process.Pdf." Accessed November 17, 2018. http://www.christopherjames-studio.com/docs/chapter7-the-cyanotype-process.pdf.

"Constanza Isaza Martinez." Accessed November 19, 2018. https://www.constanzaisaza.com/.

"Cyanotype | Constanza Isaza Martinez." Accessed November 19, 2018. https://www.constanzaisaza.com/pages/cyanotype.

"Digital Photography: A New Introduction." Thames & Hudson USA. Accessed November 15, 2018. https://www.thamesandhudsonusa.com/books/digital-photography-a-new-introduction-softcover.

"Exploring Photographs (Education at the Getty)." Accessed November 18, 2018. https://www.getty.edu/education/teachers/classroom_resources/curricula/exploring_photographs/background1.html.

"Fine Art." Science History Institute, May 31, 2016. https://www.sciencehistory.org/fine-art.

Google. *Introducing Picasa 3*. Accessed November 18, 2018. https://www.youtube.com/watch?v=rskC6c_5L1M.

Greenberg, Barbara R., and Dianne Patterson. *Art in Chemistry, Chemistry in Art*. Intellect Books, 1998.

Gs, From. "Garinger High School Improvement Team Membership," n.d., 27.

"Home |." Accessed November 19, 2018. http://www.materiallight.net/home-2/.

Mike Browne. *The Rule Of Thirds*. Accessed November 18, 2018. https://www.youtube.com/watch?v=fSSOZxLnNyc.

"What Would a CERN Scientist and an Artist Have in Common?" *Athens Science Festival* (blog). Accessed November 15, 2018. http://www.athens-science-festival.gr/en/blog_en/%cf%84%ce%b9-%ce%ba%ce%bf%ce%b9%ce%bd%cf%8c-%ce%bc%cf%80%ce%bf%cf%81%ce%b5%ce%af-%ce%bd%ce%b1-%ce%ad%cf%87%ce%b5%ce%b9-%ce%ad%ce%bd%ce%b1%cf%82-%ce%b5%cf%80%ce%b9%cf%83%cf%84%ce%ae%ce%bc%ce%bf%ce%bd/.