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You Will Find the Infinite

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Introduction

There is no such thing as a dumb question about the elements of art which I teach my K-8 students which are colour, line, shape, form, texture. The scientist Isaac Newton once said:

> "To determine…by what modes or actions Light produceth in our minds the Phantasms of Colours is not so easie."

In his revolutionary work Opticks Isaac Newton demonstrated with his experiments with light that a visible colour spectrum exists and later scientists discovered that it a small part of wide spectrum including electromagnetic radiation beyond human perception without the use of technology.[1] Isaac Newton (1643-1727) helped bring about modern scientific thought with his study of colour and transformed the linear conception of colour created by Aristotle into a disc that we today know as a colour wheel.[2] The purpose of a wheel is to understand colour relationships such as complementary colours which are opposite on the wheel and create the greatest contrast when paired with each other.[3] Indeed, colour perception is not simple! The quantity and arrangement of photoreceptor cells of cones is still being studied to better understand the biology of how humans can see millions of colours.[4] Humans have a visual system that has trichromatic color vision and is color opponent.[5] Color opponency is a way of describing how stimulation or inhibiting of photoreceptor cells in the cones happens.[6] The perception of hues, saturation and brightness of colours depends on our brains making calculations about the ratio of colors in the stimulation of nerves in our visual system.[7]

The focus of this visual arts unit written for instructing first grade students is the biology of the human eye and how humans evolved to perceive colour. It is possible to assume that the colours I see clearly are the same that others experience too, but this is not always the case because of our biology. The last unit I wrote on moss was inspired by my love of the colour green and I became curious about why humans see green better than any other colour. Colour perception is result of how our brain's visual cortex interprets signals sent from specialized photoreceptor neurons in the retinas of our eyes.[8] The pathway of sight in humans goes from the retina in our eyes to our midbrain and then to our visual cortex and in this process we determine where and what we see.[9] The visual cortex is an amazing biological mechanism in humans that can for

example measure depth in space based on elements “relative motion, perspective, shading, occlusion and relative size.”[10]

This unit is a visual arts unit for written for instructing first grade students. The expected duration of the unit is four weeks. This unit can be adapted for students in grades K – 8 in art and biology. 8th grade students for example can practice experimenting with the saturation gradation of colours by adding black or white paint colours.[11] It is a hands-on unit that requires students to record their learning in sketchpads using drawing and writing. Keeping a sketchpad encourages reflection on learning, teaches proper material use and supports literacy.



Figure 1, White Heron, Connecticut, June 2026, Kasalina Maliamu Nabakooza

The bird in the photograph I took above has binocular vision that is better than humans.[12] Some birds furthermore have four types of cones in their eyes.[13] Our understanding of the evolution of human colour vision has been informed by studies of primates which have been divided into Old-World which are most closely related and New World which are more distantly related to humans.[14] An example of an Old-World primate related to humans are chimpanzees.[15] Humans are mammals whose closest relatives are primates with which we share components of elements of our visual system.[16] Mammals specialized to hae a blue-yellow opponent system but primates evolved to also have a red-green opponent system too.[17] Primates are unique among mammals for not just being especially attentive to colour but also for recognizing what things are and where they are in space.[18] Perhaps this is why human toddlers ask questions because they are able to notice things because of their cognitive circuitry. Color blindness occurs with greater frequency in

men because it is related to X chromosome genes.[19] The first person to describe colour blindness was a chemist named John Dalton who experienced it himself.[20] There are two types of colour blindness that can occur: one from missing a cone pigment and another type which is called cortical colour-blindness, which results in colours looking grey.[21] In the first type of colour-blindness people can have trouble seeing red/green or yellow/blue.[22] One hypothesis for why humans developed three cones through evolution to distinguish between fruit food sources and for detecting predators.[23]Photo sensitive cells in the rods and cones of our eyes are sensitive to red, green or blue light to varying degrees and send signals through an electrical impulse to the visual cortex of our brains.[24] The neurons of our brain prioritize information and influence our response to the stimulus of our sense of sight.[25]

I am using the scientific discoveries by Isaac Newton as the basis for instructing how to use colour theory and colour mixing in the art classroom. Isaac Newton's experimentation with colour is the reason we use a colour wheel in the art classroom.[26] During the 1660s Isaac Newton studied colour and did experiments with light using a prism to divide light into the colours of the rainbow.[27] His breakthroughs in optics and to his later breakthroughs in understanding physical laws of the universe.[28] Newton made a hypothesis that because white light could be broken into seven colours with a prism that mixing all the colours would produce the colour white.[29] Colour wavelengths exist on a spectrum and give object colour when they are reflected and not absorbed.[30] When he tested this he found this not to be the case.[31] Students will experiment with prisms to understand the nature of light. Isaac Newton hypothesized that colour was created by vibrations of the eye but we now know that human perception of colour vision exists because nerve cells carry information from our optic nerve to our brain.[32] Our human perception of colour is influenced by our cultural frame of reference.[33]

My students are primarily bilingual or multilingual learners and live in the city of New Haven, Connecticut. My brightly lit art classroom inspired me to think about how colour is created by light. Students will learn about what colour is, how the human eye evolved to see colour, why eyes are different colours and how to use colour in art through drawing, painting, printing and collage. Students will ask questions about why we observe the world and learn about how the evolution of our brains and eyes have shaped our perception of the world around us. For example, students will learn about optical illusions and that humans have visual blind spots.

Rainbows which we can see with the naked eye are a unifying theme throughout this unit. Early experiences in the art classroom using art materials can build the basis from learning from observation. My experiences as a fellow in the Art & Biology and Landscape, Art, and Ecology seminars have sparked my curiosity about how sight works and its impact on how we interact with art materials and artworks. Students will learn to ask questions about and describe how colour impacts how they perceive and what they see in art. Students K-8 have cell phones or familiarity using computers they will learn about colour mixing is possible on screens with natural laws such Maxwell's colour triangles.[34] Students will see rainbows created by prisms then develop hypotheses about colour mixing and layering with crayon, marker, ink and paints. Students will analyze and reflect on artworks in the Yale Art Gallery by the artists Josef Albers, Sol LeWitt and Kurt Schwitters and develop artworks using colour theory.

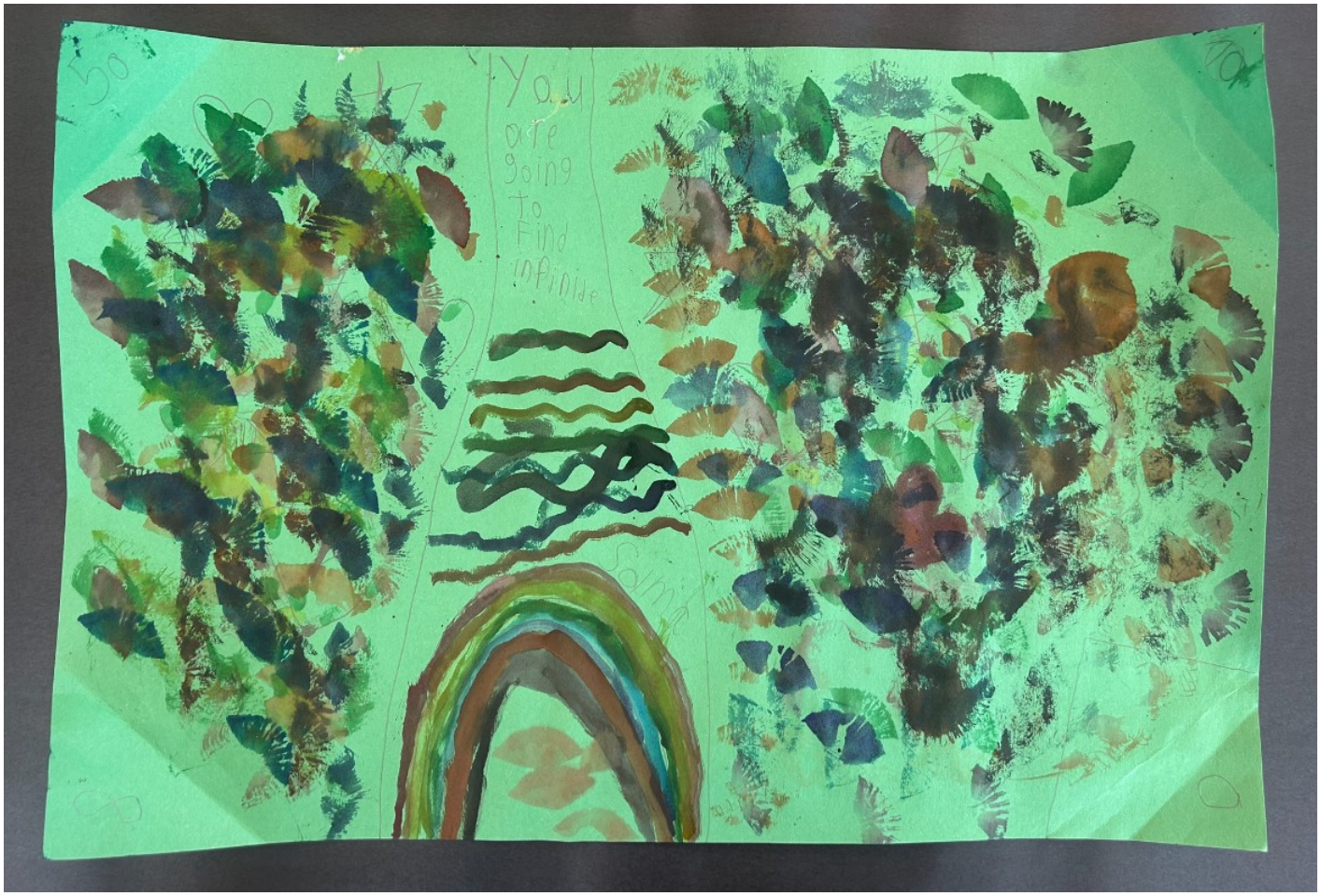


Figure 2, Watercolor artwork by a 1st grade student, April 2026

Our brains are primed for curiosity and we feel awe because of our inherent sense of wonder at the world. This spring a first-grade student made the artwork above and wrote in it “You Will Find the Infinite,” during a watercolor lesson inspired by sea turtles. As a viewer I interpreted the student’s writing as being referring to the journey turtles make to the sea upon birth. Hypothesizing how we are influenced by our perception of colour opens up new ways of interpreting the world through art. Newton experienced some of his greatest scientific breakthroughs during a pandemic when he returned home from his studies at Cambridge University. Many of our students have experienced learning during a pandemic too. The ability to imagine possibilities beyond our physical constraints is a skill which can enlarge our worldview and empower students to ask questions. According to Hubble’s Law, the universe is expanding and the farther away galaxies are from us the faster they are moving away too.[35] While reading *A Brief History of Time* by Stephen Hawking I came across Newton’s hypothesis that the infiniteness of space prevents the collapse of our universe from the force of gravity.[36] When Newton was alive he mastered most of the known science of his time.[37] While we have access to massive amounts of data we cannot ever retain all of the information that exists ourselves. However, our innate curiosity about the world is the same as it ever was and can be sparked in the classroom by encouraging students to ask questions. Over one hundred billion stars exist in the universe.[38] Parallel to the vastness and dynamism of space is the miraculous ability of our brains to process what see using an estimated $\mathbf{10^{11}}$ neurons in our central nervous system.[39] My experiences as a fellow in the Art & Biology and Landscape, Art, and Ecology seminar have sparked my curiosity about how sight works and its impact on how we interact with art materials and artworks. Astronomers mathematically use *parallax measurement* to

calculate where stars are located from our position on earth because distant stars are not located where we visually see them.[40]

Rationale

The objective of this unit is to teach students about colour and how to use art materials to created desired effects with colour in their artworks. In the process of learning colour mixing with crayon, marker, tempera paint and watercolor paint students will also learn proper material use for the art classroom. Students will use felt geometric shapes to experiment with colour to create temporary artworks inspired by the colour theory artworks of the contemporary artists Josef Albers, Sol LeWitt and Kurt Schwitters that have artworks in the Yale University Art Gallery.

Color is often tied to experience of emotions within our brains.[41] Understanding of how humans see has been an endeavor of great questioning throughout time by scientists and philosophers. Plato and Aristotle for example had differing views on determines colours and whether it had material qualities or was based on experiences of the perceivers of colours.[42] Technology has made access to colour pigments for the creation of art available in a way that was not possible in the past and has led to a wide variety of shades of colours.[43] Humans attribute meaning to colours which is shaped by our physical observations and cultural frames of reference.[44]

The photograph below is a watercolor drawing I did of a friend holding a grasshopper insect. The Renaissance German artist Albrecht Dürer whose work I admire used watercolors showing nature studies such as in his artwork, The Great Piece of Turf.[45] Close observation of colour is a skill that students can develop to enhance their artwork and understanding of the world around them. Carl Linneaus a medically trained Swedish botanist was driven by a need to understand the natural world and put it into order.[46] Linneaus created a taxonomy called the System of Nature (Systema Naturae) which was based on binomial nomenclature where every organism had a Latin name with two parts: the genus and the species.[47] He attempted to classify species in 1735 and also divided humanity into types based on his perception of colour and later added personality attributes for these types of people.[48] It is possible to look back on his way of thinking and think critically about how perception can go awry in humans who are otherwise seemingly extremely logical. Biases based on any categorization presented as an absolute truth can be extremely tenacious culturally.[49] Color names are not reliably constant across cultures because their categorization is influenced by language.[50] Perhaps there is something in our evolution as humans which prioritizes categorizing our world which can be an asset or a limitation if not paired with a deeper understanding.[51] During the Enlightenment period in Europe the scientist Richard Waller tried to describe colour in a standardized way to categorize it using Latin.[52] The way that Enlightenment artists used colour inks in printing was related to how anatomists of the time thought of skin colour.[53] During the Enlightenment, anatomists dissected human bodies and created the word *pigment* to describe skin colour but did not know why skin deep variations existed.[54] Before the industrial period colour pigments for artworks were expensive to recreate and were not standardized the way they are today.[55]



Figure 3, Drawing of a Grasshopper, 2020, Kasalina Maliamu Nabakooza

Colour can contain information about the material qualities of objects.[56] The idea of the colour white representing purity was reinforced by the misconception that Greco-Roman marbles were white.[57] Trying to understand and manage the world around us is a human trait.[58] Below are three insect specimens that I purchased at the Peabody Museum of Natural History at Yale Univeristy. The three insects displayed are a giant leaf bug, a luna moth and a morpho butterfly. The leaf bug camouflages itself and sways with movements that make it hard for the human eye to detect high in trees. Luna moths are nocturnal and have short life cycles which make them rare for humans to see. Morpho butterfly from Central and South America is neither rare nor hard to see but the structural coloration of their wing scales makes them appear different colours.[59] While turning the morpho butterfly specimen to the right or left I observed that sometimes it appears blue or purple. Colour in this example does not seem absolute but is a result of the structure of the scales on the wings of the butterfly. A polar bear’s fur has white colour with a similar phenomenon created by how their hollow hair fibers scatter and reflect light.[60]



Figure 4, Photograph of Insect Specimens, 2026, Kasalina Maliamu Nabakooza

We live in a world surrounded and outnumbered by organisms that we cannot see without the aid of technology.[61] These microorganisms vastly outnumber humans, and their species are the most numerous on the tree of life which has three branches: Bacteria, Archaea and Eurarya (which includes humans, animals, plants and fungi).[62] There are also impossible colours that exist which cannot be observed by human except after the cones of our eyes get tired creating afterimage.[63] Like experiencing a rainbow through a prism seeing afterimages is a visual activity which students can experience themselves and ask questions about. Furthermore, there are also forbidden colours which have wavelengths beyond the spectrum of what we can see.[64] Eyesight enables humans to perceive the world through the sense of sight. Some animals have evolved to have different colour vision compared to humans.[65] Light creates the conditions in which humans have evolved to see. Brown is the most common human eye colour because it is a dominant gene determined by an advantage of being less affected by UV light from the sun.[66] Like a male peacock's brightly colored feathers evolution can cause variations in traits that are not otherwise advantageous other than for attracting mates. In another organism such as stalk-eyed flies, males evolved to have their eyes on stalks protruding from their bodies because of sexual selection even though it is not advantageous otherwise to their eyes so far outside of their bodies.[67]

Darwin described the process of evolution in his book *On the Origin of Species* published in 1859.[68] Darwin took a five-year journey on the HMS Beagle to South America and Australia which led to his later theory on natural selection.[69] This process of reflection led him to ask questions about the purpose of beauty in nature.[70] Charles Darwin was captivated by colour and when he struggled to draw what he saw he used

words to describe colours in his journal during an expedition in 1832.[71] When paint colour is mixed wavelengths are removed and this is called subtractive mixing and when colours are combined with a prism to produce white light that is describe as additive mixing.[72] Hermann von Helmholtz experimented with colour and studied vision contributing to understanding of additive and subtractive colour mixing.[73] He found that subtractive mixing could be observed physically and additive mixing was a cognitive product of our human brain.[74]

Instructional Strategies

The primary instruction strategies for this unit are direct instruction and inquiry-based learning. The instructor will model proper material use with direct instruction. Students will explore new materials through experimentation with colour. Students will create artworks using their new art technique skills and demonstrate critical thinking with their development of artworks using colour to create desired effects. Drawing materials such as crayon and marker require different techniques than ink and paints.[75] Students will learn the basic anatomy of the human eye. Students will create and mix colours with paint. Students will also analyze contemporary artworks and reflect on their perception of colours in them. The unit will culminate in students exploring how colour creates awe and beauty in our experience of art.

First grade students often take their artwork home after creating projects. Keeping a sketchpad in class over the period of the unit of five weeks will create a visual record of their learning process. The children's book *Drawing Is...* by Elizabeth Haidle describes drawing as evidence of existence. In the *Asking Questions in Biology* seminar, I explored how to encourage enquiry and reflection among my students. An idea for this learning enquiry kit was inspired by a visit to the Peabody Museum. On a visit to the Peabody Museum this June I stopped to look at a specimen of a sea turtle accompanied by a drawing. I read in the caption that specimens like it had been collected on a journey by an African American man named John Dean who was a steward on a ship voyage from 1838 – 1892. He did drawings of what he observed and collected on the journey. The goal of this unit is to empower students to ask questions and test their hypotheses about colour using the tools at their disposal in the art classroom. I will provide students with a kit comprised of a pencil, paintbrush, sketchpad, prism and a magnifying glass. Throughout the process of the unit students will use their sketchpad as a place to record their observations and lessons learned as a record of their learning process.

Students will reflect on their process of learning by keeping a sketchpad where they record observations and test ideas with design and mixing of colour for artworks. The children's book *Mysterious Things* by Andy J. Pizza and Sophie Miller is about the unknown and can spark curiosity about what the world. Another student resource recommended for use in this unit is the book *A Day with The Artist* by Nia Gould which has examples of artists throughout Western art history and encourages students to spot details about them. The books *Glow* by Noelia Gozalez and Sara Boccaccini Meadows and *Spectacular Miracles of Nature* by Philippe Nessmann are resources students can use to understand the physics of light in space.

Students will create artwork individually but they will have opportunities to pair and share their observations especially when learning how to mix colours. Evaluation will be performance based and students will work independently to create artworks. The unit will culminate with the analysis of German artist Kurt Schwitter's assemblage *Merzbild mit Regenbogen* (*Merz Picture with Rainbow*). Students will discuss the cultural context

in which we understand colour and how bias/ignorance influences human perception. In the process of creating a drawing design for an assemblage students will learn about composition which is an important component of designing artworks as it shows viewers what is important to look at.[76]

Classroom Lessons

Overview: This unit is for instructing first grade students and can be adapted for grades K – 8 based on the needs of the art classroom. It can also be adapted for a biology classroom to understand the basics of the biology of colour vision sight the physics of light wavelengths. The recommended duration of instruction for this completion of this unit is four weeks in length.

Materials: Unless otherwise indicated all materials should have at least one per student in class.

5x7 Inch drawing sketchpads with heavyweight paper for all students

Scissors for Instructor

100 pieces of felt material in a wide range of colors cut into rectangles and squares

Watercolors with a full palette

Tempera Paints in Primary Colors (Red, Yellow and Blue) and Secondary Colors (Green, Purple, Orange)

Paintbrushes

Drying Rack

8 x10 Inch White Painting Paper

Water containers

#2 Pencils

Crayons

Erasers

Metric Rulers

Table Covers

Paper Towels

Elmers Glue

Mixed materials (Small pieces of precut cardboard in geometric shapes, small wood blocks, aluminum foil, tissue paper)

5x7 Inch wooden shadow boxes for students

Student selected found object from home brought in as homework for lesson 3

Hot glue gun for Instructor uses only at a station in the classroom during lesson 3

Lesson Plan 1 : Color Mixing Inspired by the Artwork of Josef Alberts

Summary: Students will analyze a Josef Alber's artwork from the series Homage to the Square representing his artistic experimentations numbering more than two thousand artworks with colours using the simple geometric form of the square.[77] Students will look at Homage to the Square: Astonished. Colour can have nuances of hue, saturation and brightness.[78] Albers believed colour was deceptive and our experience of colour was relative to what it was next to.[79] For example, a colour he found could be lighter when held up next to another.[80] An example of an illusion Albers experimented with which can be created by colour juxtaposition is the creation of afterimages.[81] A helpful guide for instructors in understanding Alber's interest in colour is the book *Interacting with Color: A Practical Guide to Josef Albers's Color Experiments* by Fritz Horstman. Horstman describes the process that Albers used in arranging colours to create artwork which I suggest can be replicated with students using square and rectangular pieces of felt of various colours.

1. Students will begin the lesson with a hands-on science activity of using prisms to see white light transform into rainbows replicating an optical experiment of the scientist Isaac Newton.
2. Students will get sketchbooks and personalize them with their names and learn how to date the pages to keep track of when it is used. Students will use their sketchpads for the duration of the unit which is estimated to be four weeks.
3. Students will use crayons to draw a rainbow in their sketchbooks as an introduction to the color wheel and learn about how the human eye evolved to perceive color.
4. Students will learn the names of the colors and color and label the in their sketchbooks.
5. The instructor will read the book *Mix It Up!*by Hervé Tullet as an introduction to colour mixing.
6. Students will in a class discussion hypothesize what colours they can create using tempera paint. The instructor will model proper material use with colour mixing of paints and demonstrate clean up expectations.
7. Students will experiment with colour mixing using the primary colours red, yellow and blue to create the secondary colours of purple, orange and green.
8. Students will create temporary colour compositions using geometric squares and rectangles of felt material. Students will layer the felt of different colours and try to create as many combinations as they can in groups of two. Students will learn that white and black are colours too but do not have hues like the other colours they created. Students will also learn about hot and color colours and color bias which influences how colours appear relative to each other as hypothesized by Albers.

Evaluation: First grade students will learn about what colour is and why we perceive colour in the first lesson of the unit. (Responding / VA:Re.7.1) Students will use felt shapes to observe how colours interact when they are next to each other. (Perceive/VA:Re.7.2)

Lesson Plan 2 : Design a Colour Composition

Summary: Students will create a rainbow color composition inspired by the *Wall Drawing #681E* designed by the artist Sol LeWitt. Sol LeWitt was an artist who using wall drawings created ephemeral monumental works that could be replicated with instructions by a team of collaborators.[82] Sol LeWitt focused on basic art

elements such as colour to make finite systems within his artworks.[83] As a docent in 2014 at the Albright-Knox Art Gallery I recall experiencing the wall drawing of Wall Drawing #1268 made with scribbles of graphite which was situated in a staircase leading to galleries in the museum. The artwork created light with the change in value from the layering of the scribbles which took months for a team to create.

Procedures:

1. Students will learn the names of line types and practice drawing marks with markers in their sketchbooks of them. Students will learn how the artist Sol LeWitt created instructions for artworks such as the example in the Yale Art Gallery that could be completed by a team of other people.
2. Students will collaborate create complete a school display with composed of rainbows with different directions of lines using pencils, crayons and watercolor paint. Students will begin the artwork by using pencils to draw parallel lines. Students will be given the choice of repeating parallel vertical, horizontal or vertical lines. Students trace the lines with crayons, then students will color the rectangles created by the lines with watercolor paint.
3. The instructor will collect the artworks and display them together in the school as one composition so the students can see how all of their marks can be combined to create a larger artwork.

Evaluation: Students will document early stages of the creative process visually and/or verbally in traditional or new media. (VA:Cr1.1.8a)

Lesson Plan 3 : Create an assemblage with a rainbow inspired by Kurt Schwitters

Summary: Students will look at the *Merzbild mit Regenbogen* (*Merz Picture with Rainbow*) by the German artist Kurt Schwitters and discuss materials and perceptions of it. Kurt Schwitters was interested in how the natural environment could be abstracted through colours.[84] Students will create their own shadow box with mixed materials and include a rainbow in the artwork using their previous knowledge of the colour wheel. Students will create their own shadow box with mixed materials and include a rainbow in the artwork using their previous knowledge of the colour wheel. Students will bring one small object from home as a homework assignment with parents' permission to include in the assemblage. Students will learn that they can incorporate something from their life experiences into artwork. Through this process, students will investigate, plan, and make artworks while exploring materials through creative play. The creation of an assemblage will require the use of glue and students will learn about how to use it responsibly in the classroom. Before gluing their objects, students will do a drawing of their composition in their sketchpads.

Procedures:

1. Students will learn the name of shapes and materials and use the terminology to analyze an assemblage by the artist Kurt Schwitters on a field trip to the contemporary art wing of the Yale Art Gallery.
2. Students will describe draw what they see in the composition using pencils in their sketchpad.
3. Students will select mixed materials in the classroom of cardboard, wood, cork, paper and tissue paper to create an assemblage in a shadow box inspired by their interpretation of the artwork and put them in labelled plastic bags.
4. Students will design their planned assemblage composition using the selected mixed materials in their sketchpad.
5. Students will bring in one object from home with the permission of their families to include in the composition to give it meaning to them from their lives. Students will also include a rainbow made with

their choice of materials within the composition.
6. Referring to their drawn composition students will learn glue techniques and have a hot glue station managed by the instructor to create their assemblages.
7. Students will display their artworks in the display cases in school on completion of the unit.

Evaluation: Students will document early stages of the creative process visually and/or verbally in traditional or new media. (VA:Cr1.1.8a)

Student Resources

Bruna, Dick. Miffy and the Artists, 2025. This a book with a popular cartoon character that has examples of art history for students relevant to this unit.

DK Books. Simple Genetics. 2025 This is a textbook for the public about genetics.

DK Books. Simply Physics. 2025. This is a textbook for the public about physics concepts.

Gonzalez, Noelia and Sara Boccaccini Meadows. Glow. 2023. This is a book about space for children.

Gould, Nia. *A Day with the Artist: Search and Discover Arty Animals at Work on This Behind-The-Scenes Tour*. London: Lom Art, 2025. [1, 2] This is an art history book for children.

Haidle, Elizabeth. 2025. *Drawing Is...: Your Guide to Scribbled Adventures*. New York: Tundra Books. [1, 2, 3, 4] This is a resource for developing sketchbooks with students using art techniques.

Hervé Tullet. Mix it Up! 2021. This is a children's picture book about colour mixing with paint.

Hollihan, Kerrie Logan. Isaac Newton and Physics for Kids. 2009. This is a children's book with science activities about the work of Isaac Newton. I am focusing on his 'crucial experiments' with colour.

Nessman, Philippe. Spectacular Miracles of Nature. 2021. This book is useful to explaining space to students.

Pizza, Andy J., and Sophie Miller. *Mysterious Things*. San Francisco: Chronicle Books, 2026. This is another text which can spark curiosity about the universe.

Conclusion

Below is a photograph of an animation drawing I did as an Electronic Arts, MFA student at Rennselaer Polytechnic Institute of my uncle George Kagaba Kakooza. He is standing in front of one of of his paintings in an exhibition. In the painting a man is reading a book as a ray of light emanates forward from his head. Variations in value create depth into the painting. The original painting was in colour and had different hues. My hand can be seen in the image pointing to his painting adding another layer of perception to the image as my uncle looks out at the viewer.



Figure 5, Drawing of my uncle at one of his art exhibitions, 2018, Kasalina Maliamu Nabakooza

Using the knowledge developed through the course of this unit students in upper-level elementary grades can more deeply analyze artworks by artists such as the Impressionists such as Claude Monet, Optical artists such as M.C. Escher and contemporary artists Andy Warhol with the knowledge from this unit and develop questions about how they perceive their artworks in their sketchpads. Students could also imagine what the opposite of artworks they encounter in their studies would be and think outside of the box creatively to develop new ways of perceiving and representing their world through art perhaps through the use of afterimages. Older students could also ask penetrating questions about the power of colours in advertising and marketing. Students might also question why names of colours exist and invent new ones as an exercise to support literacy and critical thinking. The goal of this unit is to give students a deeper appreciation of colour which is just one element of art that has a profound influence on our perceptions. The evolution of our ability to see colours visually is an ongoing dynamic process of great complexity. Color blindness occurs in humans because of Sometimes as an instructor I observe students in upper grades become inhibited from asking questions when they say that they cannot do something in the art classroom. I encourage instructors to use this unit as an opportunity to share with students how challenges and differences in learning can become strengths. As students learn about how sight works they can also learn that experiencing differences in sight can be a superpower. Usually, the creation of artwork is associated with precise visual acuity. Many other visual artists such as Rembrandt van Rijn, Pablo Picasso and Alexander Calder whose altered vision with misalignment may have been what helped create unique artwork which we celebrate today.[85] For example, one of my favorite artists is Gustav Klimt. It is hypothesized that he may have had misaligned eyes which enabled him to see images with an illusion of depth called stereopsis.[86] The ability to experience the senses in a novel way also has been a superpower for the evolutionary biologist Geerat Vermeij who became blind as a young child.[87] With his knowledge of forms and textures the paleobiologist Vermeij can use his awe inspiring skill of determining seashell fossil types uses his hands to ‘see’ fossil types which he describes as

works of art.[88] His work has led him to profound questions about the evolution of life and he was awarded the MacArthur Fellowship, which is also referred to as a Genius Grant. Museums such as the Yale Art Gallery offer adapted experiences of artworks in collections for visitors to experience their collection tactically instead of visually which makes the artwork accessible to more people. It is important that students of all abilities feel empowered to use all of their senses to create and experience artworks. With support and encouragement students with a wide range of capabilities can create of incredible work the art classroom that strengthens their resilience and curiosity.

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Appendix on Implementing District Standards

First grade students will learn about what colour is and why we perceive colour in the first lesson of the unit. (Responding / VA:Re.7.1) Students will learn about hue and observe how colours interact when they are next to each other. (Perceive/VA:Re.7.2) In the second lesson students will learn art techniques of mixing colours with the materials of crayons, markers, then watercolor paint and tempera paint. Being aware of colours having a warm or cool temperature bias helps artists to mix colours.[89] Students will develop enduring understanding through awareness developed through engagement with art to develop an understanding of self, their classmates and environment. Students will relate to art and respond to how they perceive colours in art and our world. Students can go further by discussing how colours shape our world and the impact of colour design on our experiences. In the third lesson after learning about the colour wheel and experimenting with paint colour mixing students will look at an abstract artistic work such as a painting or assemblage and respond to what they perceive about the colours in it. (Investigate/ VA:Cr1.1 and VA:Cr2.2) Students will document early stages of the creative process visually and/or verbally in traditional or new media. (VA:Cr1.1.8a)

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