2012 Summer Curriculum Institutes
for SCSU TAT Alumni

Team Leader: Judith Leach
Team Members: Stephanie White & Raquel Rodriguez
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Introduction

The 5th grade science curriculum for the New Haven Public School District does not follow a scripted/packaged curriculum. The science teacher pulls from a group of resources. These resources will be listed in the resource section. Presently, she uses the State of Connecticut Grade Level Expectations to guide her lesson objectives and long term curriculum goals. However, because of the recent changes and mandates by the Connecticut Department of Education we realize that changes will soon be made to incorporate the new Common Core Standards. Additionally, because the Common Core addresses both speaking and listening skills it has become paramount that we provide opportunities for our ELLs to demonstrate their language proficiency. This summer curriculum project has created an opportunity for our team to revisit our practices and take part in collegial conversations about how to modify both our materials and practices to best meet the needs of our ELL/bilingual population.

The modified readings were pulled from the Scholastic magazine titled, ScienceWorld. The reason we chose ScienceWorld is that it includes online access to videos and worksheets that support the related science topics. We are suggesting a different approach to showing the videos. Whereas most teachers typically use a video as an end of the unit celebration, it would be more beneficial to English Language Learners to view a video prior to or as an introduction to the topic being studied. The videos allow teachers to build excellent background knowledge related to the topic. The modifications were made to the readings in an effort to make it more accessible to English Language Learners without reducing the complexity of the content but rather to reduce the linguistic complexity. We simplified where language complexity was an issue and elaborated the text to clarify concepts. By exposing the gist of the reading and front loading target vocabulary (We chose the Frayer model for vocabulary instruction because it allows for a deeper understanding of concept words), it thereby reduces the stress of language processing overload. In doing this it allows our ELLs more opportunities to participate in academic discussions not only during literacy but more importantly in the science classroom discussions.

Mastery of content specific academic language is our end goal and using academic language in their discussions along with speaking during oral presentations will help them to master the new common core standards.
Original Reading # 1
**PHYSICS: OPTICS**

### HIDDEN COLORS

Some insects have a colorful secret. Against a bright white background, flies' and wasps' paper-thin wings look clear, but against a dark background, swirls of blue, yellow, and magenta appear. When visible light (all the colors of light people can see) shines on the insects' wings, most of it passes straight through. But a small amount reflects, or bounces, off the wings' surfaces, giving them color. A white background reflects white light, washing out the wings' colors. But a dark background absorbs light, so the colored reflections become visible. Ekaterina Shevtsova, a biologist at Lund University in Sweden, thinks the bright patterns could help insects communicate with one another. —Corey Binns

**BLACK AND WHITE:** A *Closterocerus coffeellae* wasp's wing appears transparent against a white background (left) but rainbow-hued against a black background (right).
Modified Reading # 1
Some insects have a colorful secret. Against a bright white background flies' and wasps' paper-thin wings look clear, but against a dark background, swirls of blue, yellow, and magenta appear. When visible light (all colors of light people can see) shines on the insects' wings, most of it passes straight through, but a small amount reflects, or bounces, off the wings' surfaces, giving them color. A white background reflects which the light, washing out the wings' colors. But a dark background absorbs light, so the colored reflections become visible. Ekaterina Shevtsova, a biologist at Lund University in Sweden, thinks the bright patterns could help insects communicate with one another. – Corey Binns
Original Reading Resources #1
Hidden Colors – Science World Reading

1. Why do some insects’ wings appear colorful against a dark background?
   a. Dark backgrounds don’t absorb visible light, while white backgrounds do.
   b. Visible light transmits only through white backgrounds
   c. The winds reflect light only in dark rooms.
   d. Dark backgrounds allow you to see the light that reflects while white backgrounds wash out the reflected light.

2. Make an analogy for light.

__________________________ is to _________________________

as

__________________________ is to _________________________.
Modified Reading Resources #1
Hidden Colors – Science World Article

Directions: Answer the question using complete sentences and evidence from the article.

1. Why do some insects’ wings appear colorful against a dark background?

__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________

2. Use the example to make an analogy with the following terms:

   Ex. Reflect is to bounce off as absorb is to take in

Word Bank:

<table>
<thead>
<tr>
<th>dark background</th>
<th>reflect</th>
<th>white background</th>
<th>absorb</th>
</tr>
</thead>
</table>

   _______________________ is to _______________________ as _______________________ is to _______________________.
Hidden Colors – Science World Article

Directions: Answer the question using complete sentences and evidence from the article.

1. Why do some insects’ wings appear colorful against a dark background?

Some insects’ wings appear colorful against a dark background because


2. Use the example to make an analogy with the following terms:

Ex. Reflect is to bounce off as absorb is to take in

Word Bank:

| dark background | reflect | white background | absorb |

White background is to ____________________________ as ____________________________ is to ____________________________.
**Hidden Colors – Science World Article**

Circle the correct answer.

1. Why do some insects’ wings appear colorful against a dark background?
   a. Dark backgrounds don’t absorb visible light, while white backgrounds do.
   b. Visible light transmits only through white backgrounds
   c. The winds reflect light only in dark rooms.
   d. Dark backgrounds allow you to see the light that reflects while white backgrounds wash out the reflected light.

2. Use the example to make an analogy with the following terms:
   Ex. Reflect is to bounce off as absorb is to take in

**Word Bank:**

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<thead>
<tr>
<th>dark background</th>
<th>reflect</th>
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<th>absorb</th>
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</table>

White background is to ________________ as ________________ is to absorb.
Original Reading # 2
Modified Reading # 2
Original Reading Resources #2
PART 1

Directions: Match the phrases in the right column with the words in the left column.

___ 1. simple eye
___ 2. invertebrates
___ 3. photoreceptor
___ 4. compound eye
___ 5. electromagnetic spectrum
___ 6. vertebrates

a. animals without a backbone
b. type of eye with a single lens
c. range of energy waves
d. type of eye with more than one lens
e. light-sensitive cells
f. animals with backbones

PART 2

Directions: Below are some of the adaptations described in the story that allow the creatures to pull off their cool vision tricks. Identify the animal that has each adaptation and explain how it helps them.

1. chemical “sunglasses”

2. nictitating membrane

3. can see circular polarization

4. bodies reflect ultraviolet light
The Human Eye

In “Animal Vision Revealed,” you read about the cool tricks various animals use to see. Complete the activity below to learn more about the structures of the human eye.

Part 1

Use the information in the article to define the following eye parts in humans and many animals.

1. Cornea
2. Lens
3. Retina

Part 2

Use the terms above and in the word bank below to label the diagram of the human eye. If you need help, use your notes or the interactive diagram found at the National Eye Institute: http://www.nei.nih.gov/health/eyediagram.

Word Bank

- Pupil: opening through which light enters the eye
- Iris: colored part of the eye that regulates the amount of light entering the eye
- Optic nerve: transmits visual impulses to the brain
Modified Reading Resources #2
PART 1

Directions: Match the phrases in the right column with the words in the left column.

___ 1. simple eye  
___ 2. invertebrates  
___ 3. photoreceptor  
___ 4. compound eye  
___ 5. electromagnetic spectrum  
___ 6. vertebrates

   a. animals without a backbone  
   b. type of eye with a single lens  
   c. range of energy waves  
   d. type of eye with more than one lens  
   e. light-sensitive cells  
   f. animals with backbones

PART 2

Directions: 1. Use the reading to find evidence for your answers—animal vision tricks.

2. Animal Adaptation's—Identify the animal that has each and explain how it helps them.

1. chemical "sunglasses"

2. nictitating membrane

3. can see circular polarization

4. bodies reflect ultraviolet light
Intermediate
Name: ___________________________ Date: ___________________________ Class: ___________________________

**The Human Eye**

In “Animal Vision Revealed,” you read about the cool tricks various animals use to see.

Complete the activity below to learn more about the **structures of the human eye**.

**Part 1**

Use the **information in the article** to define the following **eye parts in humans and many animals**.

1. The cornea

   ____________________________________________

2. The lens

   ____________________________________________

3. The retina

   ____________________________________________

**Part 2**

Use the **terms above and in the word bank below** to **label the diagram of the human eye**. If you need help, use your notes or the interactive diagram found at the National Eye Institute: [http://www.nei.nih.gov/health/eyediagram](http://www.nei.nih.gov/health/eyediagram).

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**Word Bank**

**Pupil**: opening through which light enters the eye

**Iris**: colored part of the eye that regulates the amount of light entering the eye

**Optic nerve**: transmits visual impulses to the brain
Frayer Model Vocabulary
See PDF Files for Worksheets
See PDF Files for Worksheets
See PDF Files for Worksheets
See PDF Files for Worksheets
See PDF Files for Worksheets
See PDF Files for Worksheets
See PDF Files for Worksheets
Resources

Frayer Model Worksheet Generator

http://www.worksheetworks.com/miscellanea/graphic-organizers/frayer.html

NeoK12 – Educational Videos, Lessons, and Games for K-12 School Kids


Optics: Light at Work part 1

Optics: Light at Work part 2

The Science of Light

The Visible Spectrum

The Electromagnetic Spectrum

Science World Magazine – Scholastic

http://scienceworld.scholastic.com/

ANIMAL VISION REVEALED

Many animals can see things that are undetectable to the human eye.

What do a barnacle spider, a praying mantis, and a seemingly simple bee have in common? They all see the world in ways that humans can only imagine.

When it comes to vision, all animals start by detecting light waves. In humans and many animals, light passes through the eyes and clear covering, called the cornea, and then through the curved lens—a both of which bend light to focus it on the retina at the back of the eye. The lens in this so-called simple eye can adjust automatically to produce a sharp image. "This is very similar to a camera, where the lens can change to focus nearby or far away," says Ezekiel Rihak, a physicist at Technion-Israel Institute of Technology. Other animals have compound eyes, with thousands of tiny lenses that don't focus as clearly but can see in many directions at once.

In scorpions, or animals with a backbone, like humans, the retina contains millions of light-sensitive photoreceptor cells shaped like rods, which work well in dim light, and cones, which detect colors. Animals with no backbone—crayfish, for example—have soft photoreceptors shaped like microscopic bottle brushes. No matter what their shape, the signals from the photoreceptors are passed to the brain, and the visual cortex then interprets them into a clear image, says Rihak.

The rosy light humans see is only a small part of the range of energy waves making up the electromagnetic spectrum (see "The Electromagnetic Spectrum," p. 15). "Light waves that are too short (ultraviolet) or too long (infrared) are not detected by our photoreceptors," says Rihak. The human eye filters out ultraviolet rays before they even reach the retina. But some animals employ amazing sight strategies, including the ability to see energy waves invisible to humans.

 Jacquie Adams
CICHLID VISION TRICK
HAS A THIRD EYELID

Fish like this red-banded cichlid don't have a proper eyelid and a protective second eye. It is a protective organ that keeps the eyes safe from injury. The eyes are protected when the fish are not swimming or feeding. The third eyelid covers the eyes and provides protection from external objects.

CICHLID VISION TRICK
HAS A BODY MADE OF "EYES"

A fish called the butterfly cichlid has thousands of eyes coated with the compound retinyl. These eyes do not sense light but can detect shapes and patterns. When the fish swims, it can see images of its own body, which helps it navigate its surroundings.

CICHLID VISION TRICK
USES ULTRAVIOLET LIGHT TO ATTRACT A MATE

Dung beetles use ultra-violet light to attract partners. This light is produced by a special organ called a pheromone gland. When the beetle is attracted to another beetle, it produces a chemical signal that is detected by the male beetle, which then uses it to locate the female.

CICHLID VISION TRICK
CAN SEE FLOWERS IN ULTRAVIOLET COLORS

A type of flower called the bee-balm has a special feature that allows it to attract bees. The花瓣 produces a chemical that is detected by the bee's ultraviolet-sensitive eyes, which helps the bee find the nectar.

CICHLID VISION TRICK

These fish have a unique ability to detect light. They can see in the dark and even in ultraviolet light. This ability helps them find food and avoid predators. The eye of the fish is adapted to detect these different light sources, allowing them to survive in their environment.
Modified
Animal Vision Revealed

Many animals can see things that are undetectable to the human eye! What do a lovesick spider, a bug-eyed crustacean, and a seemingly simple bee have in common? They all see the word in ways that humans can only imagine.

When it comes to vision, all animals start by detecting light waves. In humans and many animals, light passes through the eye’s clear covering, called the cornea, and then through the disc-shaped lens – both of which bend light to focus it on the retina at the back of the eye. The lens in this so-called simple eye can adjust automatically to produce a sharp image. “This is very similar to a camera, where the lens can change to focus nearby or far away,” says Erez Ribak, a physicist at Technion-Israel Institute of Technology. Some animals have compound eyes, with thousands of tiny lenses that don’t focus as clearly but can see in many directions at once.

Within the vertebrate’s family, or animals with a backbone, like humans, the retina contains millions of light-sensitive photoreceptor cells shaped like rods, which work well in dim light, and cones, which detect colors. Animals without a backbone, invertebrates – have photoreceptors shaped like microscopic bottle brushes. No matter what their shape, “the signals from the photoreceptors are passed to the brain, and the brain combines them into a clear image,” says Ribak.

The visible light humans see is only a small part of the range of energy waves making up the electromagnetic spectrum (See Nuts & Bolts). “Light waves that are too short (ultraviolet) or too long (infrared) are not detected in our photoreceptors,” says Ribak. The human eye filters out ultraviolet rays before they even reach the retina. But some animals use amazing sight strategies, including the ability to see energy waves invisible to humans. – Jacqueline Adams
Waves in the electromagnetic spectrum are arranged in order of *wavelength* (distance between a wave's peaks). As wavelength decreased, the wave's energy increases.
Cool Vision Trick: Secret Messages

Mantis shrimp are so strange they've earned the nickname "shrimp from Mars." These colorful crustaceans take the prize for most unusual eyesight, with at least 16 different types of photoreceptors, including ones sensitive to ultraviolet light. Each of their two independently moving eyes is divided into three sections, giving the animal trinocular vision. "Each eye sees the same thing from three different points of view," explains Thomas Cronin, a scientist at the University of Maryland, Baltimore County, who studies vision.

Mantis Shrimp signal each other by reflecting light from their bodies. But in some kinds of mantis shrimp, their shells reflect light in unusual, spiraling waves called circular polarization. They're the only animals known to have the ability to see this type of light, so, Cronin says, "It's like a secret communication channel."

Cool Vision Trick: Has a Third Eyelid

Frogs like this red-eyed tree frog shield their eyes with a nictitating membrane - a semitransparent, third eyelid. "It is a protective covering that keeps the eye safe from debris," says Tamatha Barbeau, a zoologist at Francis Marion University in South Carolina. "It also protects the eye when the frog is eating so that it doesn't get damaged by struggling prey."

The bullfrog has another fancy trick. It may help these nocturnal creatures see at night. Humans have trouble seeing colors in low-light conditions because our rods - the kind of photoreceptor sensitive to dim light - see in black and white. But bullfrogs have a second type of rod that is color-sensitive. "They can probably see color even in very dim light, where humans could only see shades of gray," Cronin explains.
Cool Vision Trick: Has a Body of “Eyes”

The brittle star is a relative of the starfish. One type, *Ophiocoma wendtii*, has long puzzled scientists. It turns a darker color in daytime. And although it appears to have no eyes, the shy creature hides when light hits it. How does *Ophiocoma Wendtii* detect light?

It turns out that this brittle star is covered with thousands of microscopic crystals made of the mineral calcite. These crystals act as lenses to focus light on nerves in the animal’s skeleton – and they focus far more accurately than any tiny human made lens. During the day, cells containing pigment rise above the crystals to protect the nerves from bright light. Changing to a darker color is the starfish’s way of putting on “sunglasses.”
Cool Vision Trick: Can See Flowers in Ultraviolet Colors

As bees buzz from flower to flower, they benefit from color vision that’s shifted toward shorter wavelengths. They can’t see red, but they see into the ultraviolet part of the spectrum. Cronin says, “A lot of flowers have ultraviolet colors, so bees can see patterns and colors in flowers that help them find nectar.” Bees also navigate by the sun’s ultraviolet rays, which read Earth’s surface even on cloudy days.

Cool Vision Trick: Uses Ultraviolet Light to Attract a Mate

How does a jumping spider get a date? Males of the species *Cosmophasis umbratica* turn on the charm by flexing their abdomens and arching their legs. A smitten female bends her abdomen, hunches her legs, and sometimes plays hard to get by skittering away. But it takes more than fancy moves to impress a prospective mate.

Parts of these spiders’ faces and legs reflect ultraviolet light, which their photoreceptors can detect. When researchers shined a light on male spiders but filtered out the ultraviolet wavelengths, the courtship rituals failed to impress females. When the same was done to females, the males ignored them. The lesson: Beauty is in the photoreceptors of the beholder.
Frayer Model Diagram

Name: __________________ Date: __________________

Definitions

Characteristics

Examples

Non-Examples

absorb
Frayer Model Diagram

Name: ___________________ Date: ___________________

Definitions

Characteristics

Examples

Non-Examples

pupil
Frayer Model Diagram

Name: ___________________ Date: ____________

Definitions

Characteristics

translucent

Examples

Non-Examples
Frayer Model Diagram

Definitions

Characteristics

transparent

Examples

Non-Examples

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