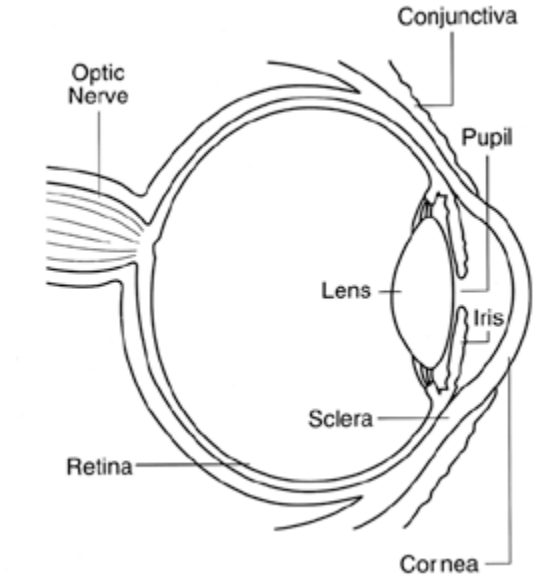
WHAT IS ILLUSION?

Wisconsin State Curriculum Alignment:
Health A.4.5 – Describe the basic structure and functions of the human body systems.

An illusion is an image or representation believed to be real in our mind's eye, but that is not actually real. In other words, because of the way our eyes and brain work, our eyes are tricked into seeing something that is not really there or into seeing something happen that did not really happen. Illusions can be very deceiving, and magicians use illusions to their advantage to make the audience believe that something happened by magic. Optical illusions tell a story about how our eyes and brain work together to allow us to see.

First, let us learn about how our eyes work. Look at the diagram below and locate the different parts of the eye. The outer part of your eye is called the *cornea*. The cornea is transparent and acts as a shield for your eye, keeping germs and dust away from your eyeball. It also directs light into your eye through the *iris* (the colored part of your eye) and into the *pupil* (the dark spot at the center of your eye.) When light passes through the pupil it moves on to the *lens*. The lens sits behind the cornea. As light passes through the lens, it is focused and forms an image on the eye's *retina*. The retina acts like film in a camera, capturing an image of what the eye is seeing, using cells that recognize light, color, and movement.



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The image captured is not yet what we see, however. It is upside down at this point, and needs to be "interpreted" by the brain before we know what we see. Another important thing about the retina is that there is a part of it that does not have any of those special cells that capture the image. This is our "blind spot." Any image that falls on this area will not be seen. The blind spot does contain optic nerves which transport the captured image from the eye to the brain. Sometimes the blind spot confuses the nerve impulses that transport the image to the brain, causing a misrepresentation -- an illusion.

The brain receives the image through nerve impulses from the optic nerve and somehow (scientists do not yet know how) turns it right side up. The brain "interprets" what the eyes see, sometimes using past experiences to help it put together an image. That is why you can look at a familiar saying, like

A penny saved is
is a penny earned.

and read it as “A penny saved is a penny earned” even though it actually contains an extra word (“is is”.) Your mind is seeing what it expects to be there, not what is actually there.

There are several different kinds of optical illusions. Scientists do not understand how all of them work. Some illusions distort an image’s size, shape, or length. Some use shadow and light or an image’s surroundings to work. In all cases we are tricked into seeing something that is not really there, or into seeing only part of what is there.

One type of optical illusion is the after image. An after image occurs when we stare at a picture or object for a while and then look away, but still see the image even though it is no longer in front of us. After images happen because of the level of contrast (the amount of difference between light and dark, for example a dark image against a white background) and brightness of the image. Try this: look at this picture of a woman for about one minute, then look at the empty box on the right. You just might see an image of the woman in the box, even though you know it is empty.

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Another type of illusion is the ambiguous illusion. This is when your brain can interpret a single image to be more than one thing. Depending on how you look at an image – the angle of the image, shading from light to dark, and the way the image is related to your past experiences – you may see something entirely different than what your neighbor sees. Here are some examples:

Here is a picture of a man, but what else is he?

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Do you see a duck or a bunny in this picture?

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Look at the "impossible triangle" illusion. At first glance, it just looks like a normal triangle, but take a closer look. Where does it end?

Some illusions cause us to see an object or scene that could not logically exist. This accomplished through the use of shading, which can cause something to appear to be farther away, and lines, which appear to give depth or dimension. Look at the "impossible triangle" illusion. At first glance, it just looks like a normal triangle, but take a closer look. Where does it end?

The illusions described above are just a few of the thousands of illusions that exist. Let us try to make our own optical illusion now. This illusion is called "watch the colors disappear" and it is taken from *Science Magic: Scientific Experiments for Young Children* by Alison Alexander and Susie Bower.

Follow the directions below:

You will need: Crayons, scissors, cardboard, ruler, jam jar lid, large-eyed needle (a wool needle is ideal), length of string about 3 ft.

1) Use the jam jar lid as a pattern to draw a circle on the piece of cardboard. Cut out the cardboard circle.
2) Find the exact center of the cardboard circle by cutting a circle of the same size out of paper and folding it into quarters. Open it up; the point where the lines

cross is the center. Using this paper as a guide, mark the center of the cardboard circle.

3) Now, divide the cardboard circle into six equal parts. Color each section differently using colors of the rainbow – red, orange, yellow, green, blue, and purple. Repeat on the disc's opposite side matching the colors on the back to those on the front.
4) With the needle or the point of the scissors, *carefully* make two small holes on either side of the circle's center point, half an inch apart.
5) Thread the string through the holes and knot the ends together to form a loop.
6) Put one finger in each loop and twist up the string by spinning your hands around. By moving your hands together and apart again, you can make the disc spin. What happens?
7) All of the colors will seem to disappear as the disc spins and the disc will look as though it is white.
8) When the disc is spinning, all of the colors go around very fast. Because you see them all at the same time, your eyes can't separate the colors out. Instead, your brain thinks the disc has no color at all and that it is white.
9) By the same token, you can see colors in a black and white disc as it spins. Use the same disc pattern and locate the center of the cardboard disc. This time, divide the disc into eight equal sections. Using India ink (careful – this stains!) or a black permanent marker (the black sections must be very black), color every other section. Again, repeat this on the other side, matching the black sections with those on the front. Using the needle or tip of the scissors, make a small hole on each side of the center point, one-half inch apart. Thread the string through the holes, tying it into a loop. Spin the disc and see if you can see colors. In this instance, scientists believe that when the retina receives repeated flashes of white light for a short time, the optic nerves fire in patterns that your brain interprets as color. You can see color when no color exists.

Try these optical illusions out on your friends and family! Do they see what's really there or does their brain cause them to see something else?