Vision: From Illusions to Blind Spots

Lesson Time: 2 Hours
Skill Level: Basic
Number of Families: 8
Deployment Segment: Reunion/Reintegration
Target Audience: Families with Pre-Teens or Teens
Internet Required: No

Life Skill Objectives:
- **Communication:** Identify and describe blind spots in both a visual and social context
- **Self-responsibility:** Understand how visual and social blind spots influence how we interact with others
- **Problem Solving:** Improve problem solving through applying an understanding of visual differences

Resilience Skill Objectives:
- **Social:** Understand that social blind spots can strain relationships
- **Family:** Communicate that different points of view need not create Family conflict

Science and Technology Objectives:
- Understand that vision, visual illusions and blind spots are primarily due to brain functions, situational factors, and past experience
- Appreciate how Family members see (visually as well as socially) things differently by understanding the science of vision
- Illustrate the technology of vision through visual experiments and blind spots

Activity Overview:
Youth and Families will explore together how our brain can perceive what is seen through visual illusions. Using that knowledge, youth and Families will explore and create illusions and discuss how illusions impact our social and Family interaction.

Shout Out to Families!
Most of us take vision for granted, we don’t think about the ways our brain is involved in what we can see, or if we can really see it and believe it. However, our visual perceptions are not actually what is in the real world but are instead inexact images of real objects in our brains. Families will learn about differences in visual perceptions, how to create visual illusions and what it really means to “see things from different points of view” in our families.

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**Budget Range for Activity:** $5/per Family

**Space Needed:**
Indoor or outdoor space with tables and large enough to conduct group activities.
**Before The Event**

**Get Ready:**

**Tasks for the Lead Volunteer**

- Practice the activities, review all materials and handouts
- As background, the following websites illustrate visual illusions:
  - What optical illusions show us about visual perception: [http://thebrain.mcgill.ca/flash/a/a_02/a_02_p/a_02_p_vis/a_02_p_vis.html](http://thebrain.mcgill.ca/flash/a/a_02/a_02_p/a_02_p_vis/a_02_p_vis.html)
  - Sight-Vision: [http://faculty.washington.edu/chudler/chvision.html](http://faculty.washington.edu/chudler/chvision.html)
  - Ted Talks: Beau Lotto Optical Illusions Show How We See: [http://www.ted.com/talks/beau_lotto_optical_illusions_show_how_we_see.html](http://www.ted.com/talks/beau_lotto_optical_illusions_show_how_we_see.html)

**Do Ahead:**

In coordination with the Military Point of Contact:

1. Schedule use of the Tech Discovery Tool Kit (2 Tool Kits = 8 Families).
2. Schedule use of the Mobile Technology Lab
3. Contact volunteers and go through online training.
4. Ensure wireless Internet access.
5. Borrow or buy supplies.

**Copy:**

- Make Your Own Optical Illusions handout (1 per Family)
- Blind Spot Test Form (1 per person)
- Filling the Blind Spot Form (1 per person)
- Family Letter (1 per Family)
- Hermann Grid Illusion (1 per Family)
- Bird and Cage Illusion (1 per Family) (Must be in color)

**Get from Tech Discovery Tool Kit:**

- Laminated Life/Resilience Skill signs to post around your space (Communication, Self-responsibility, Problem Solving, Social and Family)
- 8 iPad 2 devices (1 per Family) which has the following app updated:
  - YouTube
- Wireless external speaker
- iPad/VGA connector

**Get from Mobile Technology Lab:**

- Wireless router
**Buy or Borrow Supplies:**

**Icebreaker: I Spy**
- Nametags for all Family members, volunteers and anyone else who will be present (Tech Discovery Tool Kit)
- Sign-in sheet
- Writing utensils

**Introduction: Animal Adaptations**
- 8 iPad 2 devices (1 per Family) (Tech Discovery Tool Kits)
- Wireless router (Mobile Tech Lab)
- Ensure wireless Internet connection
- iPad/VGA connector (Tech Discovery Tool Kit)
- LCD projector and screen
- Wireless external speaker (Tech Discovery Tool Kit)
- Extension cords/power strips as needed

**Activity 1: Visual Illusions**
- Hermann Grid handout (1 per Family)
- Bird and Cage handout (1 per Family)
- Make Your Own Optical Illusions handout (1 per Family)
- 12” pipe cleaners of the same color (2 per person)
- 12” pipe cleaners but **not** the same in color or the same color as above (2 per person)
- Yardstick (1 per Family)
- Scissors (1 per Family)

**Activity 2: Blind Spots**
- 3 x 5 inch cards or stiff papers (2 per person)
- Marker (1 per person)
- Yardstick (1 per Family)
- Glue or glue stick (1 per Family)
- Scissors (1 per Family)
- Copies of the Blind Spot Test Form (1 per person)
- Filling the Blind Spot Form (1 per person)

**Activity 3: Trust Walk**
- Blindfolds (1 per person)
- (optional) Rope (1 per Family)
Day of the Event

Roles for Volunteers:
- Help Families with all activities and form a positive connection with the Families
- Provide positive support for Families throughout the activities
- Assist Families in setting positive goals
- Facilitate problem solving and use teamwork when Families become frustrated or have questions
- Assist with setup and cleanup

Before the Families Arrive…
1. Orient volunteers to the overall objectives of the lesson making sure they all have name tags and have introduced themselves to each other before you get started.
2. Activity Orientation for all Volunteers (before the beginning of the event):
   - Review each activity emphasizing application of each of the identified life skills (page 1)
   - Cue volunteers where to look for the Life/Resilience Skill objectives in the directions and remind them of the importance of discussing them with Families during the activity
   - Remind volunteers how these skills will help Families manage reunion/reintegration issues and adjustments
   - Have volunteers help set up for the event and get ready to welcome Families

Set Up Your Space:
Space: Tables and chairs
1. Post Life Skill/Resilience Skill Signs around the space.
2. Set up a greeting table with sign-in sheet.

WHAT TO DO Vision: From Illusions to Blind Spots

As the Families Arrive….
- Have youth and Family members write their names on the sign-in sheet and put on a nametag
- Introduce yourself, your team of volunteers and others that might be in the room along with their roles

Icebreaker: I Spy (15 minutes)
1. Get acquainted by playing I Spy, a guessing game about things we see. Two Families should gather together to make one group (8 Families = 4 groups).
   a. Each member of the group is given time to look for something in sight or that is visible around them. This can be any object - a building, a plant, food or article of clothing.
b. The first player starts by saying, "I spy with my little eye, something that _____." This clue could be anything about the object, such as "…starts with the letter H", "…is yellow", or "…is round".

c. The other group members take turns asking one yes or no question at a time about the object. Questions might be asked about the color, placement (where it is), size, etc.

d. The first player answers with only a "yes" or "no" until the object is correctly identified.

e. Once the object is identified, another group member begins with the selection of another object. The game continues until everyone has had a turn.

Debriefing Questions:

“This is an old game that Families would play on long car rides before MP3 players, iPads and smart phones took people’s attention away from the world around them.

- Did you notice that some in your group were able to guess correctly more often than were others? Why do you think they were more successful at guessing or seeing certain objects?
- Were you surprised by some of the items that were noticed? Had you noticed them?
- What might be some reasons why some noticed items that others missed? Do you think that some see things that others don’t? Do your Family members see things differently?”

Introduction: Animal Adaptations (30 minutes)

“Animal adaptations are one example from our natural environment of something being seen more easily by some and not by others. Without an adaptation, a plant or animal could have become extinct.

“Why do you think plants and animals have needed to adapt?”

- Responses could include:
  - Other animals like to eat the plant and it could quickly become extinct
  - Without enough water, the plant could die so the plant has new ways to survive
  - By changing color it is easier to hide

“Plants and animals have made adaptations that have allowed them to survive in their habitat. This might mean the texture or color of a leaf is different or the color patterns of an animal’s hide will help them to hide or catch their prey better.

“Let’s watch a YouTube video that gives us a couple examples of how some animals have adapted to their environments. This video shows how body structure and behavior can help an animal survive in a place that many creatures might not.”

- Connect one iPad 2 device to the LCD projector using the iPad/VGA connector
- Connect the iPad 2 device to the wireless external speaker via Bluetooth connection
- Select the YouTube app and search for “Animal Adaptations lmiller23elon”

“Now, let’s take a look at a website as a Family team and see how well you can identify the camouflaged animals. These photos are terrific examples of how adaptations are important to survival. I’d like you to use the Safari app on the iPad 2 device to look up the following website:
http://www.wherecoolthingshappen.com/19-perfectly-camouflaged-animal-photos/, it may take some time to load. Again in your Family team, look at the photos. These photos all have animals in them and your goal is to identify each one. Try not to look ahead for the answers too soon. These photos are terrific examples of how adaptations are important to survival. Enjoy!

“In your Families, you probably discovered that some of your Family members could readily see the camouflaged animals when others had difficulty seeing what seemed to be obvious to others. Why is it that some people can see visual images more readily than others? This difference in vision has to do with how our visual pathways deliver images to our brains, the environment, our view points and experiences.”

“We see when light reflects off of objects, it enters the eye and stimulates cells on the surface of the retina which is the thin membrane at the back of the eyeball. These cells, which are called rods and cones, are sensitive to light. Rods are more numerous and are more sensitive to light than are the cones, but they are not sensitive to color. The photoreceptor (i.e. receptor stimulated by light) cones allow us to see color and are concentrated in the middle of the retina. These cells then send electrical signals to the brain through the optic nerve in patterns that communicate the intensity, placement, and timing of the light. The brain then creates images from these signals based on past experiences. Sometimes, however the brain gets confused by what the eyes are showing it. Let’s demonstrate that confusion.”

Activity 1: Visual Illusions (20 minutes)

“Though our eyes are fairly reliable, there are times when what we see isn’t accurate. Sometimes the eyes send our brains visual illusions that are confusing and puzzling. Most people think that illusions are tricks, but they’re actually what happens when the brain is confused. The brain tries to make sense of the confusing images by choosing the most probable possibility based on past experience. Visual illusions take place when what we think we see differs from what actually exists in the real world. Let’s try some visual illusions.”

Distribute a copy of the Hermann Grid Illusion to each Family. Have Family members look at the box and ask them what they see. Participants should see gray spots appear at the intersections of the rows and columns created by the squares, because of a phenomenon called lateral retinal inhibition. If you stare directly at one of these intersections, however, the gray spot disappears, and it looks white, because then you are using cells located in the upper region of the retina which do much less correction for an area's surroundings.

Distribute a copy of the Bird and Cage Illusion to each Family. Have Family members look at the bird for about 20 seconds, then look at the cage: the bird's silhouette will appear inside it, in red. Once participants have seen the bird move, explain that the reason this happens is because cones sensitive to the color green, become desensitized, so
that the other cones like red begin to dominate. When you then look at the cage, with its white background, a red bird appears, because the white minus the green creates a reddish light. The image that persists when you stop looking at an object is called a ‘residual image’.

Distribute the Make Your Own Optical Illusions handout, pipe cleaners and scissors.

“Let’s make our own optical illusions. Each Family should have one handout titled, “Make Your Own Optical Illusions,” a scissors and pipe cleaner for each Family member. First, have your Family look at the four optical illusions on the handout. What do members of your Family see in the pictures? There are no right or wrong answers. Some will see the illusions differently than others.”

Move forward with the activity once Family members have seen and discussed the four illusions.

“Now, let’s make your own illusion. Follow the directions on the next pages of the handout making sure that each member of your Family can make their own pipe cleaner illusion. Have fun!”

Roam around the room helping as Families complete their pipe cleaner illusions. When most Family members have completed their pipe cleaner illusions reconvene everyone. Lead a discussion of optical illusions.

Debriefing Questions:

• What was something that you learned about optical illusions you had not known before? What was most interesting?
• What are some other optical illusions that you have seen before?
• As you experienced the optical illusions, were there some surprising reactions? Would you like to see (experience) more illusions?
• Why do you think that people are usually interested and intrigued by visual illusions? Could it be that people are interested in (and even attracted to) them because they are unique, different and fun?
• What then can we ‘take away’ from this experience with optical illusions? How can our understanding of the confusion that some visual images create for our brains be relevant to being together as a Family? Is it confusing when we “see things so clearly” and other Family members don’t?

“This is sometimes called a blind spot. So let’s find out more about them.”

Activity 2: Blind Spots (20 minutes)

“The optic nerve is coupled to the far side of the retina, just opposite the pupil of the eyeball. A tiny blind spot exists just where the optic nerve joins the retina because there are no rods or cones there. You don’t notice this blind spot often because your two eyes work together to cover it up. However, most adults have had the frightening experience of moving out to pass a car while driving and discovering that another car they hadn’t seen is coming up immediately to
their left. That car, which has probably honked to warn us, was in our blind spot. Let’s do an activity to find out where you have your blind spots.”

Distribute the Blind Spot Test Form 1 per person.

Have each Family member:
1. Cut out the image and glue it to the 3” x 5” cardstock.
2. Completely extending one arm, hold the card at eye level about an arm’s length away. The card can be propped up on a yardstick to steady it. The yardstick should be roughly parallel to the floor, with one end touching your cheek. The “X” on the card should be on your right-hand side.
3. Close your right eye. Look at the “X” with your left eye. Stay focused on the “X,” but also be aware of the dot.
4. Slowly move the card toward you, staying focused on the “X.” As you slowly move the card, you will find a region where the dot disappears and reappears. You have found your blind spot.
5. Repeat steps 3 and 4 with your left eye closed and your right eye focused on the dot. Can you identify the distance in which the “X” disappears?

NOTE: The following may be used in addition to or in place of using the Blind Spot Test Form:

“Sometimes our brain plays tricks on us to compensate for this blind spot.”

Distribute the Filling the Blind Spot Form 1 per person.

Instruct Families to:
1. Cut out the Filling the Blind Spot Form image and glue it to the 3” x 5” cardstock. Using the card just as in the first experiment, close the right eye. Hold up the card, balancing it on the yardstick.
2. Focus your left eye on the “+” and slowly move the card towards you. The empty space between the lines will disappear when you reach your blind spot because your brain is compensating for the lack of an image.

When most Family members have completed the blind spot activity(s), reconvene everyone.

Debriefing Questions:
- What was interesting about this activity?
- What did you learn about the blind spots of other Family members?
- What experiences have you had before with your blind spots?
- How do you feel knowing that you and everyone around you have blind spots that prevent them from seeing certain things?

“You may have also heard the term “blind spot” used to describe how we might not see certain problems, issues or opportunities.”

Vision: From Illusions to Blind Spots
• Do you think you may have blind spots when it comes to certain issues or problems? Everyone has blind spots with certain relationships or experiences. How might these social blind spots be dealt with once we are aware of them?

“Our visual and social blind spots are sometimes best dealt with together – as a Family. Working together as a Family requires patience and trust.”

**Activity 3: Trust Walk (20 minutes)**

**NOTE:** Be prepared for some Family members wanting to “opt out” of this activity. Encourage them to join in, assure their safety and let them know that the walk is less than one hour and they can stop at any time. Some Wounded Warriors may not be able to undertake this activity. Be gracious and excuse them from the activity without risk of embarrassment. Find other ways they may still be involved: spotters or encouragers of their Family.

Prior to this activity, find a good location with a few, easily managed obstacles, but nothing dangerous or unsafe. Mark this location to assure that Families will be safe during this walk. The activity consists of each Family walking together in a predetermined location while blindfolded. Ask one of the adult Family members to be the navigator (guide), and the other members will be blindfolded. Family members form a line, one in front of the other, and each person either places one hand on the shoulder of the person in front or holds onto a rope which can connect Family members together.

Describe the Trust Walk activity to all Family members. Let everyone know that you have selected a safe location, they will be monitored by additional staff/volunteers, they can opt out at any time and after about 5 minutes they will have a chance to change guides and continue their walk.

Then, have Families pair up into groups (8 Families = 4 groups). Ask one of the adult Family members to be the navigator (guide), and the other members will be blindfolded. When the blindfolded members are ready and hands are in place, send them off on the walk. Be sure to closely monitor the location and activities of each group. After about 7 minutes of the walk, ask groups to stop and ask them a few questions such as:

1. What was it like to be the guide, responsible for the safety of your groups? How did you plan for your role?
2. For those who were blindfolded, did you notice that your other senses (e.g., hearing, smell, touch) seemed to be stronger since you could not see? Did you have any difficulty trusting your guide while blindfolded? Why or why not?

After the group has answered these questions and if time remains, ask groups to select a new group leader and continue the walk until they hear the “time’s up” sound.

**NOTE:** This would be a good opportunity to assign 1 volunteer to each group to ensure group safety.

The Family leader is solely responsible for his or her group’s safety. Groups should be navigated to avoid obstacles. In this way, participants learn valuable lessons related to
teamwork: the guide learns about the challenge and responsibility of caring for others’ well-being, while the blindfolded Family members learn to trust and rely on others.

When Family groups complete their walk, have refreshments available and invite them to wait until all Families are present to complete the lesson.

“We’ve all returned from the trust walk and I thank you for participating. Let’s spend a few moments discussing the Trust Walk and what we have accomplished today during our lesson on vision.”

**Debriefing Questions:**

- What was it like to have members of another Family in your group who you might not know well?
- Why is trust in your Family and in other Families important?
- How did it feel when you and your group members successfully trusted each other to accomplish something challenging?
- How does this relate to vision, illusions and blind spots?

**Talk It Over:** *(10 Minutes)*

1. To help you focus the discussion, briefly look at Life Skill, Resilience Skill, and Science and Technology Objectives on page 1.
2. Lead the entire group through the Talk It Over discussion.
3. Have a volunteer take comments/notes about group dynamics and specific Family comments.

**Share/Reflect**

- What did you learn about vision today?
- What was memorable about what we did together?

**Process**

- What did you learn about your Family today?
- What did you learn about yourself?
- How might you check your social blind spots?

**Generalize**

- How do those unique, intriguing visual illusions relate to unique, intriguing Families?
- How might a better understanding of blind spots relate to an understanding of the social blind spots we sometimes have as Family members?

**Apply**

- How might you apply your better understanding of how some Family members see things differently?
- How does your understanding of vision, visual illusions, blind spots and trusting Family members help you relate to others?
- What will you do to reduce the social blind spots that might be interrupting your relationships with others?
Debrief Families on Life/Resilience Skills:
Point to the Life/Resilience Skill Signs that are posted around the space: Communication, Self-responsibility, Problem Solving, Social and Family. As you point to each sign, ask:
- How have our activities today helped you develop your ________ skills?
- Why do you think these skills are important?

Closing & Cleanup: (5 Minutes)
“Thank you for participating in today’s lesson on Vision: From Illusions to Blind Spots. We hope you have enjoyed the information and activities about vision and those things (visual illusions, blind spots) that can hinder seeing what’s really there. Most importantly, we hope you have enjoyed working together as a Family to understand vision and build trust.

“Please be sure to take home your visual illusions, blind spot tools and Family Letter. Have a great day!”

Extend the Activity:
Use any of the following resources to learn more about visual illusions and make your own:
- Illusions of the Year: http://illusionoftheyear.com/
- 106 Visual Phenomena and Optical Illusions: http://www.michaelbach.de/ot/
- What optical illusions show us about visual perception: http://thebrain.mcgill.ca/flash/a/a_02/a_02_p/a_02_p_vis/a_02_p_vis.html
- Sight-Vision: http://faculty.washington.edu/chudler/chvision.html
- Ted Talks: Beau Lotto Optical Illusions Show How We See: www.ted.com/talks/beau_lotto_optical_illusions_show_how_we_see.html

When Family members don’t see “eye to eye” or have different “points of view,” remember how vision differs from person to person due to physical and social factors. Try to understand the other person’s point of view.

Post Event

Lead Volunteer:
- Check to make sure that the space is clean
- Have all equipment and supplies back into kits or packed up to return to appropriate Military Point of Contact
- Fill out report:
  - Names of all volunteers
  - Number and names of youth and Family members (attach sign-in sheet)
  - Quotes from youth and Family members on activities
  - Other important notes on activities, volunteers and youth
  - Critical follow-ups (parents expressed behavior/worries about a particular youth, inappropriate language from a volunteer, dissatisfaction, etc.)
Activity Developed for Tech Discovery Curriculum by:
Elaine Johannes, Ph.D., Associate Professor and Extension Specialist – Youth Development, Kansas State University Research and Extension
Kia Harries, Regional Extension Educator, University of Minnesota Extension Center for Youth Development

The Tech Discovery Curriculum was developed at the University of Minnesota Extension Center for Youth Development through a partnership of the Department of Defense, Office of the Secretary of Defense, Military Community & Family Policy, Office of Family Policy/Children and Youth and the United States Department of Agriculture, National Institute of Food and Agriculture, Institute of Youth, Family and Community, 4-H National Headquarters under Kansas State University special project number 2010-48713-21882.

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Vision: From Illusions to Blind Spots
Vision: From Illusions to Blind Spots

Dear Family,

Thank you for participating with us in Vision: from Illusions to Blind Spots, a lesson that helped your Family:

- Understand vision, visual illusions, blind spots and visual differences
- Appreciate those visual differences and abilities
- Understand the social blind spots that each of us have as Family members
- Build trust in your Family

As you return to home, school, and work please continue to notice what you see, what you miss seeing and how some of your perceptions may be illusions. Those visual illusions can remind us that we can also have social illusions that can prevent us from seeing what is really happening in our families.

Continue to keep your eyes open and look for those unique ways to share what you see with others and understand others’ points of view.

Thanks again for your participation in this Tech Discovery experience!

Best regards,

Conversation Starters:
- What do you often see that others miss?
- How could you avoid accidents related to not seeing things due to your blind spots?
- As a Family, how do you help each other work through those social blind spots that can create Family member stress?
VISION – From Illusions to Blind Spots

Photos and Illustrations Handout

As you prepare for the VISION- From Visual Illusions to Blind Spots lesson, duplicate the following pages of photos/illustrations.

The original source of the photos and illustrations which follow are located at:

1. Hermann Grid Illusion (1 Per Family)
   source 1: http://www.nku.edu/~issues/illusions/HermannGrid.htm
   source 2: http://thebrain.mcgill.ca/flash/a/a_02/a_02_p/a_02_p_vis/a_02_p_vis.html

2. Bird and Cage Illusion (1 per Family)
   Source 1: http://media.log-in.ru/i/ptica-v-kletke.gif
   source 2: http://thebrain.mcgill.ca/flash/a/a_02/a_02_p/a_02_p_vis/a_02_p_vis.html

3. Blind Spot Test Form (1 per person)
   source 1: http://faculty.washington.edu/chudler/chvision.html
   source 2: http://thebrain.mcgill.ca/flash/a/a_02/a_02_p/a_02_p_vis/a_02_p_vis.html

4. Filling the Blind Spot Form (1 per person)
   source 1: http://faculty.washington.edu/chudler/chvision.html
Hermann Grid Illusion
Bird and Cage Illusion
Make Your Own Optical Illusions

Summary:
Have you ever seen an optical illusion? Just as people learn how to read, they can learn how to make sense out of the rays of light that hit the eyes. The brain learns "rules" of seeing; for example, the farther things are from you, the smaller they appear. But when an object or drawing breaks the rules, or when it could be interpreted in different ways, your brain tends to apply the "rules" and may give you wrong information or one perception of the information that makes most sense.

In this activity, you will:
- Understand that optical illusions are made by our brain trying to make sense of the information that our eyes see
- Look at optical illusions and recognize why they appear the way they do
- Make an optical illusion and describe how it works

Materials:
- 2 long pipe cleaners of equal length and equal color. (Example: 2 red pipe cleaners that are 12” long)
- 2 long pipe cleaners of equal length but not equal in color. (Example: 1 purple and 1 green pipe cleaner that are 12” long)
- Scissors to cut pipe cleaner.
- Plenty of friends and Family members to show and explain your optical illusion!

Optical Illusion 1: What do you see in the picture below? This is the example optical illusion so the answer will be posted below the picture. However, for the next 3 optical illusions the answer will be posted at the end of the activity.

What did you see? Are the stairs on the floor or on the ceiling? ____________________________
Answer 1: Both perceptions are valid, but it is more likely that you saw the stairs as on the floor because you expect them to be there.

Optical Illusion 2: Look carefully at both flowers. Are the centers in both flowers the same size?

Optical Illusion 3: What do you see in the picture below?

Optical Illusion 4: Describe what you see below.
Make Your Own Optical Illusion

Use 4 equal in length pipe cleaners: 2 of the same color, 2 of differing colors.

1. Take two pipe cleaners that are the same length and the same color. If they aren't the same length and color, the optical illusion will not work.

2. Now, cut in half two other pipe cleaners that are a different color. You will use these different colored pipe cleaners to make the ends of your arrows.

3. Wrap the middle of one short pipe cleaner around the end of one long pipe cleaner. Then bend the short one in half so it looks like an arrow. Repeat this process on the other side with the same color pipe cleaner.

Pipe cleaner with an arrow on one side:
Be sure to put arrows on both sides of your pipe cleaner.
4. Then, repeat with the remaining long pipe cleaner, but this time, your arrows on the ends will be turned in the opposite direction (an inverted arrow).

On the second pipe cleaner,
turn your arrows on each end in the opposite direction.
Be sure to do this process on both ends.

5. Now, take your completed pipe cleaners and hold them up side by side. Then, slowly move your pipe cleaners apart. You have created an optical illusion!

Explain what you noticed as you moved them apart. Also, which pipe cleaner looks longer (not including the arrows)?

6. Now, show your two arrows to a friend or a family member. Repeat the process of moving the arrows away from each other and ask your friend or family member which one looks longer. Have a ruler handy to show them they are of equal length.

Extension:
Search for more optical illusions! There are many sources on the internet which display optical illusions. See how many you can find and also notice how creative they can be.

References and Further Information about Optical Illusions:
- [http://www.coolopticalillusions.com](http://www.coolopticalillusions.com)
Answers to Optical Illusions:

Answer 2: The center circles are exactly the same size although the left center circle appears larger than the right one. Objects can appear larger or smaller when placed next to objects of different sizes. In this case, we judge the size of the center circles in relation to the surrounding circles.

Answer 3: Tilt your head to the right, and you'll see a duck. Then turn your head to the left and you'll see a bunny rabbit.

Answer 4: This is another classic example in the history of optical illusions. Usually, our eyes are used to reading black text on a white background, so at first when you look at these shapes above you see just that - shapes. But, after you look for a little longer you'll see that the white space actually spells a word - LIFT.
Blind Spot Test Form
Filling the Blind Spot Form