CEREBRO EDU

# EDUCATORS'**GUIDE**

# WELCOME



## Program Introduction

Welcome to CEREBROedu. This bilingual (español/English) program was developed with and for Latino communities to help educators, children and families:

- Learn about the brain's structure and function;
- Discuss everyday habits that foster and maintain good brain health;
- Explore great careers in neuroscience and/or brain health; and
- Become more aware about mental health resources in your community.

Best of all, you don't have to be a neuroscientist to lead CEREBROedu programming! Simply keep an open mind (or brain!), and use the following resources:

- **Activities and Professional Development:** Online training will empower you to engage Latino youth and families around Brain Structure; Brain Connections; The Brain in Action; and Brain + Behavior. You'll also learn how to spark discussion about neuroscience educational and career pathways, use role models in your programming, talk about mental health and more!
- **Event Guides:** Kick things off with a Welcome Event and wrap up your programming with a Family Fiesta. Your learners and their parents, caregivers, siblings are all invited; the more, the merrier! The enclosed Event Guides provide step-by-step instructions on how to create gatherings that are filled with information, learning, celebration and (of course!) food.
- **Role Model Videos:** In these brief bilingual profiles, relatable Latino neuroscience and mental health professionals share about their careers and educational journeys, as well as highlight their families, friends, culture and heritage.
- **Engagement Tools:** SciGirls Family Guide for Engaging Girls in STEM and SciGirls Guide for Engaging Latino Families publications provide the additional guidance you need to make your CEREBROedu programming robust, culturally responsive and fun. Visit www.scigirlsconnect.org for more information.

Thank you for participating in CEREBROedu. We're glad you're here!

## Creating A Well-Rounded Youth Program

Educational programs are more than the lessons or activities within them. Brain breaks, transition activities, snacks, and more create community and become an essential part of any youth program. With this in mind, we designed CEREBROedu to allow time for educators to help youth get to know each other, build connection, and create an ideal learning environment.

The CEREBROedu program was designed to be 32 hours long. This includes around 1.5 hours per curriculum module as free time to conduct any activities you choose. A breakdown of program timing is below:

- Welcome Event [2 hours]
- Module 1: Curriculum [5 hours] Transitions, brain breaks, etc. [1.5 hours]
- Module 2: Curriculum [5 hours] Transitions, brain breaks, etc. [1.5 hours]
- Module 3: Curriculum [4 hours] Transitions, brain breaks, etc. [1.5 hours]
- Module 4: Curriculum [6 hours] Transitions, brain breaks, etc. [1.5 hours]
- Family Fiesta [4 hours]

We suggest incorporating team building activities at the beginning of your session, and between each activity. This could be as simple as eating a snack, or it could be a structured brain break. An average brain break should take between 5 and 15 minutes. Type “brain breaks” into your favorite search engine to bring up hundreds of activities, or open your camera app and point your cell phone at the QR codes below:

We Are Teachers

ThoughtCo.

Teach Thought

The Welcome Event is the first meeting of your CEREBROedu program. This full family event will gather youth, their parents/guardians, siblings, and other family members and friends together to eat, create community, and learn about the program. In this guide you will find a suggested timeline and schedule, and tips to make the event your own.

## Best Practices

This event is very loosely scheduled. Brain health can be a very sensitive topic. Giving families time to connect with each other in a safe environment will lead to greater engagement and learning later. Suggested elements include:

- Food
- Information about your program
- Time for families to connect with each other.

Beyond these requirements, you can schedule other activities, like a facility tour or a game, or just allow more time for conversation. This is up to you!

## Suggested Event Timeline

- 4:15 – 5:00 Set up
- 5:00 – 6:00 Dinner and an icebreaker
- 6:00 – 6:30 Program information, including logistics
- 6:30 – 7:00 Time for questions

Below you will find more information on each piece of this event. As members of your community, you know how the families in your program would like to spend their time. So be creative! You may use all the tips below or adjust the pieces to fit your needs.

## Set Up/Dinner

- Use family style seating, like long tables, to encourage community building.
- Consider ordering food from a local community restaurant. Alternatively, a potluck is both inexpensive and highlights the traditions of your program's families.
- Ask families about languages spoken at home, and ensure that there is a translator at the event who can answer questions in families' preferred language(s).
- Consider having icebreaker questions written out at each table. Some possible questions include:
    - "What is your favorite meal?"
    - "Who is your role model and why?"
    - "Why are you interested in this program?"
- Make sure that staff and educators talk to each family, and that families have a chance to connect with each other.
- Create a sign-in sheet to track attendance.
- Create name tags, and make sure to have enough for every family member.

## Program Information

- Repeat date and time information for the program, including the Fiesta de la Familia.
- Ensure that families know what to do in the event of program cancellation for severe weather or any other reason.
- Tell families that there are two parts to this program: the youth piece and the family piece. Share that the Family Fiesta is a great time to help families learn about the program, as well as mental health resources in their area.
- Leave time for questions.

You may also want to include videos, role models, community partners, and more in this event. You can also discuss your organization, and promote other programs or services you provide. At the end of the night, your goal is to ensure that families are knowledgeable, excited, and invested in your program.

Thank you, and happy planning!

### Notes

At the end of your CEREBROedu program, youth, their families, role models, and community stakeholders will be able to gather and share knowledge in a fun, low stress environment. This is a great time to show off the hard work youth have been doing in your program and connect youth and families with role models and community resources. In this guide you will find Fiesta best practices, a suggested timeline and schedule, and tips to make the event your own.

## Best Practices

Though we want to ensure that your program's Fiesta is tailored to your site, youth, and families, we do want to ensure that the event focuses on both the hard work the youth in your program put in, as well as the career connections and community resources available to families. To this end, all programs should include:

- Food
- At least one neuroscience role model
- At least one community resource, such as your local NAMI chapter, a block nurse, a social worker or government programs representative, or similar, and
- Hands-on activities for families to enjoy.

## Before the Event

### One Month

- Choose your activities from the educator guide.
- Confirm the location/venue.
- Invite role model(s) and staff/volunteers. Ensure that there are staff or volunteers available that can translate, if necessary.
- Create a detailed agenda with assignments for staff, volunteers and role models.
- Advertise the event through flyers, community bulletin boards and social media.
- Plan for dinner or refreshments. This could mean ordering food from a local restaurant, planning a potluck dinner, or buying prepackaged food from your local supermarket.

### One Week

- Map out the space and request any tables, chairs or other furniture.
- Shop for activity materials.
- Email activity directions to role models and volunteers.

### One Day

- Order/buy food.
- Copy activity directions, informational pamphlets, or any other information you will be sharing with participants.

## Suggested Event Timeline

- 4:15 – 5:00 Set up
- 5:00 – 6:00 Dinner/Role Model Meet & Greet
- 6:00 – 7:00 Activities
- 7:00 – 7:30 Clean Up

## After the Event

Follow up with community partners, role models, and families. What did they think went well? What could have gone better? What would they change next time?

## Tips

**1: Plan multiple activities**, and activities that are appropriate for a variety of ages (as siblings may participate). Go to PBSKIDS.org/lab and click on "activities" to find ideas for engaging younger learners.

**2: Work with role models** and girls to choose activities. If role models or youth want to run an activity that is not listed here, that is great! Just ensure the activity is engaging and culturally responsive.

**3: For more meaningful** conversation with families, consider having role models around during the dinner portion of your Fiesta, in addition to running activities at tables.

## Using Role Models

**How might you use role models?**

### Face to Face

- Ask volunteers to run hands-on activity stations. If possible, pair a role model with an activity that is related to their field.
- Have a dinner as part of the evening and spread the role models out at different tables.
- Start with an ice breaker.
- Provide short STEM activities that people can do at tables to get to know each other.
- Provide questions/talking points for role models to discuss during dinner. Some questions could be:
    - Share a favorite science, technology, engineering or math experience. What made it your favorite?
    - What do you like to do for fun?
    - What do you wish you had known about working in a STEM field?
    - What is the best part of your job?
    - Ask youth about their favorite STEM experiences, hobbies, etc.
- Provide families an opportunity to ask questions.

### Virtual

- Set up a Skype or Google Hangout time during the Fiesta where role models can introduce themselves and talk a little about their jobs. Leave time for youth and families to ask questions.

## How can you find role models?

- Search the FabFems directory fabfems.org.
- Reach out to your local universities, community colleges.
- Look within your own organization.
- Reach out to local STEM companies.
- Talk to families in your program.
- Learn more about training role models using the SciGirls Role Model Strategies guide. Visit www.scigirlsconnect.org and search Role Model Strategies for more information.

## Partnering with Community Organizations

### Recruiting

- Many local community partners will be excited to share resources at your event.
- Start by calling your local NAMI chapter, Latino-serving organizations, clinics, or social welfare agencies.
- Share the purpose and rundown of the night, including who will be attending, and examples of resources they may want to provide.
- Request volunteers who speak any or all languages present, or recruit someone who can translate for the community partner.

### Tabling

- Set up your community organization(s) at tables along the side of your venue.
- Create signs to signify each organization. Request that the partners bring their own signage, tablecloths, or other materials if they choose.
- Encourage community partners to place pamphlets and giveaways on their table. If possible, request they bring any information they have in multiple languages.

### After the Event

- Be sure to retain partner contact information for future partnerships or follow up questions.

# CURRICULUM

## What's Up?

This Welcome Activity will help you get to know the youth in your program and explore what pre-existing knowledge and/or ideas they have about the brain. This insight will prepare everyone to work together throughout the course of the project. Remember that youth may be excited, nervous, or both; that's okay!

### You'll Need

1) Method for showing video
2) A large piece of paper
3) Markers
4) Name tags
5) One hour

## Smart Start

- Greet youth as they come in.
- Have youth create a name tag and encourage them to personalize it with drawings of hobbies, pets or other fun decorations.

## Here's How

**1: Welcome youth to join** an opening discussion in which you will all learn more about one another. Some questions you could ask are:

- Why did you decide to attend this program?
- What are you hoping to learn?
- What do you find interesting about the brain?

**2: Watch a video** about brain form and function. Good online sources include the National Geographic website and YouTube.

**3: Discuss** the following questions:

- What was interesting about this video? What surprised you?
- How can learning more about the brain be helpful or important to you?

**4: Talk about** how this program is a fun and interactive way to learn about the brain. Remind youth that everyone will explore new things, challenge some of the things we think we know, and enjoy learning together.

**5: Ask youth to** brainstorm some rules they agree to follow while working together. Examples of such rules could include "Be safe" or "Make sure everyone has a chance to talk." At the end, be sure to add "Have fun!" Write this list on a large piece of paper and hang it in the room. Refer to it during the program if youth are not honoring their own rules, or if they would like to add to their list.

## What's Up?

Our brains are like supercomputers, in charge of every move we make. So how exactly do brains store so much information? In this activity, we will learn how the human brain's wrinkles help to make it so powerful, and why the wrinkles are an important part of what separates our brains from those of the animal species around us.

### You'll Need

1) Large sheets of newspaper, or other large paper (at least 20 inches x 20 inches)
2) Rulers or measuring tapes
3) Scissors
4) Rolls of tape (clear or masking)
5) Sheets of construction paper
6) Pictures of mammalian brains (at end of instructions)
7) One hour

## Here's How

**1: Divide youth into groups** of two or three. Give each group a piece of construction paper and ask them to cut it into a 9 inches X 9 inches square. Have youth calculate the surface area of the sheet (9 X 9 = 81 square inches).

**2: Give each group** a newspaper. Ask them to cut it into a 19.2 inches X 19.2 inches square. Have youth calculate the surface area of the sheet (approximately 369 square inches).

**3: Either ask youth** to find the difference between the two areas of the sheets (369 – 81 = 288 square inches) or ask them to describe the differences between the two sheets (the newspaper is much larger than the construction paper).

**4: Now challenge youth** to find a way to make the newspaper fit evenly over the construction paper without cutting or wrapping the paper. You should be able to read all the newsprint from some angle. Taping the edges of the newsprint to the construction paper is allowed.

**5: Once all groups have finished,** have youth share out their solutions. How did they arrive at their conclusions? Why do their newspaper creations have the shape that they do?

**6: Tell youth** that the construction paper has about the same surface area as the helmet-shaped part of an average human skull and that the sheet of newspaper has about the same surface area as an average human cerebrum. By wrinkling their newspapers, they were able to fit a large amount of information into a small space. This practice of wrinkling up the paper is similar to what has happened with the human brain: over 2 million years of human evolution, humans developed more cerebral tissue (the thinking part of the brain) and their brains tripled in size (the thinking part of the brain). Human brains formed wrinkles, making it possible for more brain tissue to fit into the space in our heads!

**7: Have youth look** at the pictures of different animal brains. What differences do youth see? What do these differences tell us about the intelligence of each species?

Opossum brain

Rabbit brain

Cat brain

Monkey brain

Chimpanzee brain

Human brain

Courtesy of Bioed Online

## What's Up?

Want to learn more about the human brain's physical characteristics? Investigate a sheep's brain! Sheep brains and human brains share many similarities, so studying sheep brains can help us learn more about our own brains' structure.

### You'll Need

**Per group of 3-4 youth:**

**Dissection Materials**

1) Sheep brain
2) Plastic knife and/or scissors
3) Disposable plates or dissection tray
4) Disposable gloves
5) Sheep Brain Dissection Guide (handout for students)

**Label Materials**

1) Toothpicks or T-pins
2) Colored pencils or markers
3) Paper and tape or blank address labels
4) Brain Vocabulary List (within the dissection guide handout for students)
5) 2 hours

## Here's How

**1: Discuss.** Ask youth why scientists use animals to learn about the human brain, and share some facts with them:

- Dissections are a hands-on way to learn about anatomy.
- Human brains are made out of the same stuff as any other animal brain. All brains are made out of neurons – cells that communicate with each other through electrical and chemical signals. The shape and size of human and animal brains vary, but they all work pretty much the same way.
- Even though other animals are not capable of many of the functions found in humans like speaking, moral reasoning, or complex learning, many of the basic structures and functions of the brain are common to all animals.
- This is why scientists can investigate the brains of other animals as models (such as worms, fruit flies, fish, mice, and sheep) and still learn something about how the human brain works.
- The sheep brains we will use were purchased from Carolina Biological Supply, who shares this information: "The sheep organs preserved by Carolina are by-products of the food industry. They come from sheep that have been slaughtered for the

human food market, i.e. to produce lamb. We convert waste by-products to materials for educational use."

**2: Prepare.** Have the group make dissection label flags. First, youth will write the name of each brain part (found on the vocabulary handout) on small pieces of paper. Then they will attach these pieces of paper to toothpicks/T-pins with clear tape. Encourage the students to use their creativity to help them remember the function of each brain part. For example, they might draw a small picture of a person snoring next to the thalamus, which (among other things) controls alertness and sleep. Groups should have their labels completed before they begin observation and dissection of the sheep brain.

**3: Observe.** Distribute gloves, plates, and brains (but no knives or scissors yet; you're just observing and talking about the brain, not yet dissecting). In small groups, ask them to think about the following questions:

- What does the brain look like? (Youth may note sections, grooves and wrinkles, size, weight, texture, etc.)
- How are sheep brains similar to human brains? (Youth may observe that the sheep brain has the same overall structure or features as they human brain.)
- How are they different? (Youth may note that sheep brains are smaller than human brains, about 1/10 the weight. You can share that the sheep brain stem points back instead of down, because sheep walk on four legs and people walk upright. The proportional sizes of the sections of the brain are not the same in sheep and humans; for example, the human brain's frontal lobe, which is the area responsible for thinking, language, problem solving and memory, is larger than a sheep's brain. Sheep have a very good sense of smell, so their olfactory bulb is much larger than a human's.)

**4: Identify.** Before youth start cutting into the brain, have them label parts that they can identify, using their identification pins and the sheep brain diagram. Make sure youth flip the brain over and look at the bottom too.

**5: Dissect.** Time to cut! Youth should follow the steps on the Sheep Brain Dissection Guide. If time allows, let youth decide if their group would like to investigate their brain further, such as making more dissection cuts.

**6: Discuss.** Encourage youth to share: What was most interesting/surprising? How are sheep brains and human brains similar/different?

**7: Clean.** Dispose of all dissection materials, including sheep brains, plates, gloves and other items in a double plastic trash bag. Have youth clean all surfaces and wash their hands with soap and water. In most cases, you can dispose of the dissection materials as you would any other trash. Here is the statement from the sheep brain supply company: "Specimens preserved in Carolina's Perfect Solution® can, in most cases, be disposed of in a school's regular waste destined for a landfill or incinerator. The specimens are not classifiable as federal hazardous waste and do not represent a biohazard. However, you should check with your local solid waste authority (local governmental authority in charge of solid waste, local landfill, or waste disposal company if applicable) to ensure that this is an acceptable practice. If it is, we recommend that you double bag the specimens before placing them in your school's regular waste."

## Brain Vocabulary List

Youth should use the following list to make labels they will use while conducting their dissection. Labels should have the name of the part, and then a single word or sketch that helps you remember what that part of the brain is responsible for in humans.

- Note: *starred brain parts are not found in the pictures below. See if you can still find them!

***Brainstem:** It is connected to the spinal cord and controls automatic activities such as breathing, coughing, sneezing, heartbeat, digestion, and swallowing. It also regulates when you feel sleepy or awake. Parts of the Brainstem are: The Medulla, Pons, and Midbrain.

**Cerebellum:** The cerebellum helps muscles work together to coordinate and learn movements, and to maintain balance and posture. It is responsible for reflexive movements such as blinking the eyes. It also has a role in the formation of memories for knowing how to do things like riding a bike, walking, talking, playing piano, swimming, playing baseball, etc.

***Cerebrum:** It is the largest part of the brain. It is responsible for thinking, learning, language, remembering, planning, feeling sensations, emotions, and voluntary (on command) muscle movement. The cerebrum is divided into two halves: the right and left hemisphere. The right hemisphere controls the left side of the body and performs tasks that have to do with creativity and the arts, and understanding relationships in space such as reading a map. The left hemisphere controls the right side of the body and performs tasks that have to do with logic, such as science and math, problem solving, comparing information needed to make decisions. It is also the brain's language center.

**Corpus Callosum:** A large bundle of nerve fibers that connects the two hemispheres of the Cerebrum. It is responsible for transmitting messages between the right and left hemispheres.

**Frontal Lobe:** The area of the Cerebrum that is important for functions that help us learn such as thinking, memory, attention, language, speech, problem-solving. The frontal lobe also controls voluntary muscle movement, impulse control, judgement and social behavior. You use your frontal lobe to make decisions, such as what to eat or drink for breakfast, and studying for a test. The frontal lobe is where your personality is formed and also allows you to speak fluently (without fault). Location: frontal and upper part of the brain.

**Gray Matter:** The part of the brain that looks darker in pictures. The cells in this part of the brain help us do things like think and process information. It contains most of the brain's neuronal cell bodies and other brain cells called glial cells. These glial cells provide nutrients and energy to neurons. Gray matter is mostly found on the brain surface, or cortex.

**Gyrus (pl. gyri) and Sulcus (pl. sulci):** The surface of the cerebrum is very wrinkled; it has folds (gyri) and grooves (sulci) that look like hills and valleys; these allow more cerebral surface tissue to fit inside our skull. A folded brain surface has a greater surface area – which means a greater power for processing information!

***Hippocampus:** A small, curved formation in the Cerebrum which is responsible for the formation of new memories, learning, and emotions

**Occipital Lobe:** The area of the Cerebrum primarily responsible for vision. It processes the information that your eyes are sending.

**Olfactory Bulb:** A structure found underneath the front of your brain just above the nasal cavity. Molecules carried through the air and into the nose bind to neurons in the moist lining of the nasal passages. These neurons send messages to the olfactory bulb to allow us to smell thousands of odors (floral, fruity, spicy, burnt, putrid).

**Optic Chiasm:** An X-shaped space where the optic nerves (bundle of nerve fibers that transfer visual information to the brain) from your right and left eye cross.

**Parietal Lobe:** The area of the Cerebrum that processes sensory information – the information that your brain collects from your senses. It processes information about temperature, taste, touch, pain, etc.

***Pituitary Gland:** An organ the size of a small pea, located at the base of the brain. It is formed by cells that produce hormones that allow the body to react to stress.
Spinal Cord: Is a large bundle of nerves inside your spinal column. The spinal cord is very important because it is the main pathway for messages (sent by neurons) to travel between the brain and all the other parts of the body. Thanks to the spinal cord we can feel sensations like pain, and control the movements of our arms and legs.

**Temporal Lobe:** The area of the Cerebrum important in controlling how you process sounds and use of language. This region also helps process long-term memories and also contributes to your personality, and understanding and appreciation of music and art.

***White Matter:** The part of the brain that looks lighter in pictures. White matter are the highways of the brain. They connect different parts of the brain and pass information from one part of the brain to others. It is made of nerve fibers (axons) that connect nerve cells (neurons) from one region of the brain to another. The nerve fibers are covered with myelin, a protein that contains fat. Myelin gives white matter its white color and protects the nerve fibers from injury. It also helps to improve speed and transmission of electrical nerve signals. White matter is buried deep in the brain.

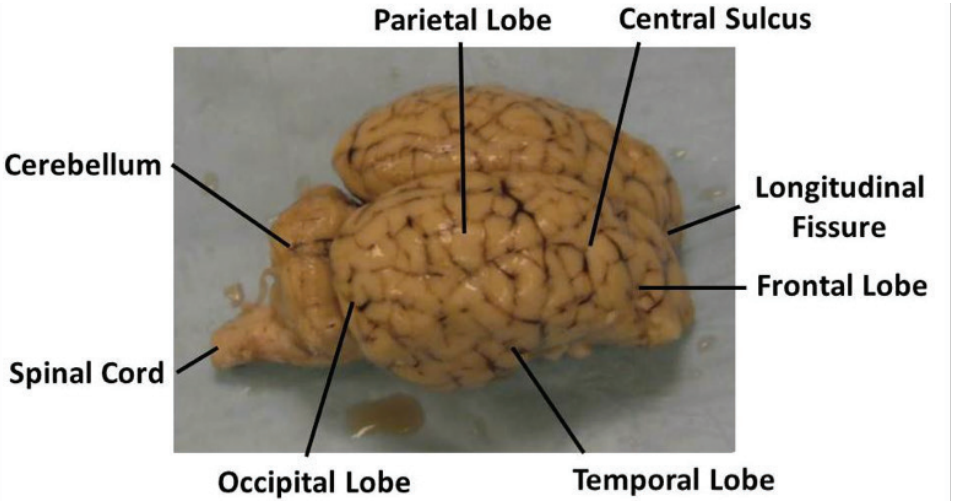



Image credit: Tufts University

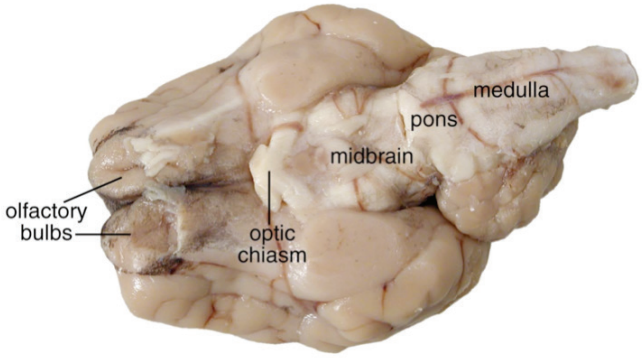



Image credit: homesciencetools.com

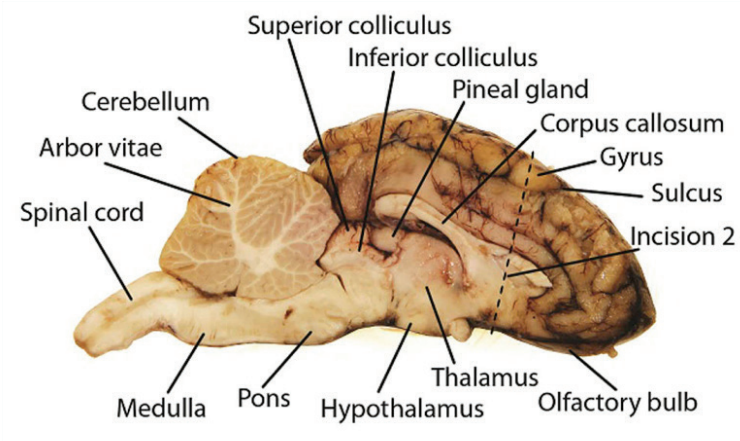



Image credit: homesciencetools.com

## What's Up?

The nervous system allows our bodies to react to different stimuli. This exercise investigates the time it takes us to react to a stimulus, and how changing variables may change reaction times by causing our brains to work harder.

### You'll Need

1) Wooden or plastic ruler (12inches or 30cm)
2) Paper and writing utensil
3) Calculator (or smartphone)
4) One hour

## Smart Start

Discuss reactions and reflexes. A **reflex** is an action that happens automatically, like shivering or blinking when a puff of air hits your eye. A **reaction** is voluntary, requiring a person to sense something, process the information, and then react to it.

## Here's How

**1: Discuss.** What do you know about reactions? What could cause reaction times to be fast or slow?

**2: Work in groups of two or three.** One person will drop the ruler ("dropper") while the other catches it (catcher) and another records the data (recorder). If working in groups of two, the dropper and data recorder can be the same person.

**3: Drop the ruler.**

a. The dropper holds the ruler at its top, by inch 12 and/or centimeter 30, with the ruler hanging straight down. The catcher places their thumb and index finger at the bottom, by inch and centimeter 0, but not touching the ruler.
b. The dropper will let go of the ruler, and the catcher will try to catch the ruler as fast as they can.
c. The recorder will record the distance dropped. Hint: repeat the test multiple times and averaging the time in order to get a better idea of your reaction times: Add all your numbers together, then Divide by how many numbers you have.

**4: Do it again!** Repeat the test, changing one variable at a time: **a.** Distraction Test: Have the catcher say out loud every other letter of the alphabet while waiting for the ruler to drop. **b.** Auditory Test: The catcher closes their eyes. The dropper will say drop as

the signal for the catcher to catch the ruler. **c.** Tactile Test: The catcher closes their eyes. The dropper will touch the shoulder of the catcher as they let go of the ruler. The catcher will catch the ruler when they feel the shoulder touch.

**5: Switch roles,** so that each member of the group has information about their reaction times.

**6: Have the young people** display their data in a chart, graph, paragraph, sketch, or other way. Be creative!

**7: Discuss!** What did you learn? How did using different senses (touch, hearing, sight) affect your reaction time? What does this tell you about how your brain processes info? What other factors might affect reaction time (e.g. sleep deprivation, age, etc.)? Why is it important to learn about reaction times? [For example, multi-tasking like being on a cell phone will driving can slow reaction times, causing accidents.]

## Keep the learning going:

In this activity, students are comparing distance data when discussing reaction time. This is appropriate for this activity. However, students can convert their distances to times with a little math. For this experiment, we can calculate the time it takes for the ruler to fall a certain distance (the distance they measured when they caught the falling ruler). The equation y = ½ gt2 simplifies to time (seconds) = square root [(distance in cm)/(490 cm/s2)].

## What's Up?

Our skin has receptors that detect different stimuli, like temperature and pressure. This activity will challenge youth to investigate how the skin's receptors are distributed, and how that distribution affects how their sense of touch.

### You'll Need

1) Ruler
2) Wire paperclips
3) Paper
4) Markers, pens or pencils
5) 45-60 minutes

## Smart Start

Before you launch this activity, learn and talk about the parietal lobe:

- The parietal lobe is a part of the brain. It is located on the top and near the back of the brain.
- This lobe brings together information from different senses, particularly spatial sense and navigation.
- One way the parietal lobe receives information is through our skin's receptors, which detect different stimuli.
- Receptors are proteins that are inside a cell or on its surface. Receptors translate information from the outside world and from internal organs and tissues, and translate the information into impulses that travel along nerve cells, or neurons.
- Receptors are distributed unevenly across our bodies. For example, our fingers and lips have more touch receptors than other parts of our body.
- For us to feel two separate touches, the touch needs to activate two separate receptors in our skin, with one "un-touched" receptor in between. These activated receptors trigger a series of nerve impulses that make their way to the parietal lobe of the brain for interpretation.
- Areas of skin where touch receptors are spaced farther apart require larger spaces between tiny point sources of touch to help us actually feel that there are two touches. If the two points are too close together, it will feel like one touch point.
- Areas where touch receptors are closer together can 'feel' touch points that are closer together. Our fingertips and faces have the highest density of receptors, while places like our arms, legs, and back have the lowest density.

This experiment measures the two-point discrimination threshold for two areas of their body (fingertip and arm). They will use the results of their experiment to make inferences about the receptor spacing on their fingers and arms.

## Here's How

**1: Discuss.** How do our brains know when something is touching our arms? Youth will offer ideas, and you can share the following:

- There are receptors in your skin that can send a message to the parietal lobe of your brain.
- Is your arm as sensitive to touch as your fingertip? How could we measure that?

**2: Investigate.** In small groups, have youth assign themselves the role of neurologist (brain doctor), patient and data recorder. Roles will be switched at the end of the activity to allow for a variety of experiences. Once roles are assigned, groups decide between the following methods of making their two-point discrimination tester. Youth can bend paperclips, using their ruler to measure the distance between the two ends of the wire, or they can tape toothpicks to a notecard, using the ruler to measure the distance between the points of the toothpicks.

When groups have created their two-point discrimination testers, have them follow these steps:

- The patient should close their eyes while the neuroscientist gently but firmly touches both points to the skin, being careful that the points touch at the same time. The patient will say whether they felt one distinct point of contact or two. The recorder records their response.
- Conduct this exercise with spacing of 3 mm, 10 mm, 15 mm, 20 mm and 30 mm.
- Switch roles, so that each person has data about their own arm and fingertip.
- Encourage youth to display their data in a way that they choose (e.g., table, bar graph, line graph, paragraph, sketch or text). Make sure youth use appropriate labels and titles.
- Have groups pair up with another group so they can all discuss, compare, and contrast their data.

## Discuss

### Encourage youth to consider:

- What was most interesting?
- What did you learn?
- What were the differences between testing your fingertip and your arm? What does the data show?
- What does the word "infer" mean?

- What can you infer about the number of receptors in your arm vs. your fingertip, based on the data you collected?
    - Fingertips have more receptors, and receptors are closer together.
    - Arms have fewer receptors, and receptors are farther apart.
- What are ways that humans use the high-sensitivity of their fingertips? (Braille may be one example.)
- The exercise we just did is called two-point discrimination, and is something that neuroscientists sometimes do with patients that have injuries. Why do you think they do this? (Note: testing for nerve damage may be one example.)
- Can you extend this experiment to another area on the body? (Note: legs will be similar to their arms, and lips will be similar to fingertips.)

## What's Up?

Some people like broccoli and some people hate it. There may be a scientific reason! Cruciferous vegetables (like broccoli and cauliflower) contain bitter compounds called glucosinolates. Specific human genes determine whether a person can taste this bitterness. To test for this, scientists use PTC (phenylthiocarbamide), a man-made compound similar to glucosinolates. Some people can taste it, and some cannot. For those who can taste PTC, you can make a scientific case for why you don't like to eat your vegetables!

### You'll Need

1) Cruciferous vegetables (e.g., broccoli, cauliflower, collard greens, kale), washed and cut into bite-sized pieces
2) Other vegetables (e.g., carrots, yellow, orange or red bell peppers), washed and cut into bite-sized pieces
3) Knife and cutting board
4) Paper towels
5) Blindfolds (1 per small group)
6) Paper and pencils
7) PTC paper (provided in kit)
8) Water and/or juice (for each youth)
9) 45 minutes

## Smart Start

Find out what food allergies youth have and choose your vegetables accordingly.

## Here's How

**1: Explain** that some people may dislike certain vegetables because they taste bitter, but not everyone can taste this bitterness.

**2: Poll youth** to determine their like or dislike each of the vegetables chosen for the experiment and record the results.

**3: Design a taste test.** Break into small groups and challenge youth to brainstorm ways to conduct a blind taste test and tell them they will need to determine a way to score or rate the level of bitterness in each vegetable. For example, they might decide to have peers rate bitterness on a 1-to-10 scale or figure out a system of facial responses that indicate bitterness.

**4: Test for PTC sensitivity.** Hand out a strip of PTC paper to each youth and explain that it contains a bitter compound like the one found in some of the vegetables they tested. Have them touch the strip to their tongues to see if they can taste it. The bitterness can be overwhelming so have something (like juice) available to drink!

**5: Evaluate results.** Compile data into graphs or charts. Did youth who tasted the PTC rate the broccoli as more bitter? Did these same youth originally say they disliked broccoli? Did any youth who can't taste PTC dislike broccoli?

**6: Consider this pointer:** It's okay if youths' results aren't perfect! Many factors affect bitterness. Collard greens and kale, especially, can be bitter, even to those who can't taste PTC. Discuss why subjective testing (like taste tests) can be challenging. It's all part of scientific inquiry!

## What's Up?

Balance is something we all learn when we first start to walk. It's essential for everyday activities but can also be important for hobbies like gymnastics, surfing, martial arts, dancing, slack lining, skateboarding and riding a bike. We use signals from both outside and inside our bodies to make sure we stay upright.

### You'll Need

**Have youth find a partner and give each pair:**

1) A blindfold
2) A couch cushion, throw pillow, or thick blankets
3) A measuring stick or baseball bat
4) A timer
5) Paper
6) Pencil
7) 45 minutes

## Here's How

**1: Brainstorm.** As a large group, list places or activities where balance is important or when the youth have lost their balance (like on a moving bus, train or rollercoaster; while riding a bike or skateboard, while walking across a balance beam or rickety bridge, etc.). Why might it be important to have better balance?

**2: Discuss balance.** Share with youth that balance is defined as being able to maintain a controlled body position while doing tasks or even just sitting still. To stay balanced, the body relies on information from three different sources. Touch involves pressure cues from your feet, legs, arms, and other body parts help the brain know where your body is in space. Sight relies on visual cues to help the brain know whether and where the body is moving. The inner ear has sensitive features that help the brain detect gravity and movement.

**3: Practice balance.** Have youth share an experience that required balance, or in which they lost balance. Have the whole group test their balance. Ask everyone to stand on one foot, fold their arms across their chest, and close their eyes. How long can they stay balanced? Remind youth that everybody has different abilities around balance so this shouldn't be considered a competition.

**4: Investigate.** When the brain can't get certain information from the body it is harder to maintain balance. Asking youth to keep this in mind, challenge them to design an experiment that determines what type of information (touch, sight, inner ear) most affects balance. As a large group brainstorm how you can alter touch, sight, and inner ear information. Feel free to suggest some of the following simple ways to alter these senses:

- Stand on one foot
- Walk on a simulated balance beam (put two lines of tape on the floor 6 inches apart)
- Stand with one foot on the ground and another resting on a ball or short stool
- Stand on a pillow, couch cushion, or thick blanket
- Stand on your tiptoes
- Blindfold, or close your eyes
- Turn off the lights;
- Close one eye and spin around multiple times quickly (looking up, down, or straight ahead).

**Note:** If the youth are not familiar with designing experiments, you can do this part together and then test it in the two-person groups. To make sure you are only testing one variable at a time, change only one thing at a time (for example, use a blindfold or stand on one foot, but don't do both together). Design a procedure to test balance that can be repeated multiple times. Run multiple trials, testing the same person each time. Run a control trial (for example, no blindfold).

**5: Share.** Have each small group share how changing different variables affected their balance. Were there some variables that didn't make a difference? Which variable(s) affected balance the most? Were there any commonalities across the different groups? Who would benefit most from knowing what affects balance?

**6: Extend.** The best thing about balance is that anyone can improve with practice. Athlete like surfers, dancers, and martial artists often have better balance than other people because they constantly practice their balance. Have groups practice the balance activities regularly for an extended period of time, like a week or two, then do the experiment again. Did their balance improve?

## What's Up?

When you decide to move a muscle, neurons in the motor cortex of your brain send electrical signals that travel along neurons until they reach your muscle. These electrical signals are also called action potentials. Action potentials can be recorded using EMG (electromyography). In this activity, youth will see and hear how neurons communicate, and how the brain instigates activity through electrical signals (action potentials).

### You'll Need

1) EMG Spiker Box
2) Cable
3) Computer, tablet, or smartphone
4) Two popsicle sticks with brass fasteners attached
5) Conductive gel
6) One hour

## Smart Start

Before working with youth, take some time to learn how to use the Spiker Box. Download the Spike Recorder app from Backyard Brains, and open it on your computer, tablet, or smartphone. https://backyardbrains.com/products/spikerecorder

- For computers: The Spike Recorder App defaults to using the sound input from the microphone on your computer, so we need to change this. Click on the gear symbol in the Spike Recorder app. Under 'Select port:' click on 'Muscle SpikerShield,' then click 'connect'.
- For tablets or smartphones: The app will need access to the microphone, so select yes when it asks.

## Here's How

Start with a full group discussion. Ask youth:

- How does the brain activate your muscles? (The brain sends an electrical signal that is relayed through neurons all the way from the brain, along the spinal column, to the muscle cells.)
- Which muscles are used to move your fingers? (Up and down movement of your fingers is controlled by muscles in your forearm. Side-to-side motion is controlled by smaller muscles in the back of your hand.)

## Part I: Electromyography

- Set up your Spiker Shield by connecting the wires and power: Plug in the orange wire (with 3 clips attached) to the orange port on the Spiker Shield. The 3 clips will

be used to measure the EMG signal on the subject's arm. A light green LED on the top center of the Spiker Shield will light when it has power.

   a. **For computers:** use the blue cord (USB-A to USB-B) to plug into a USB on your computer, and the yellow marked port on the Spiker Shield. (There is no need for batteries attached to the Spiker Shield since the USB provides enough power for the device.)
   b. **For tablets or smartphones:** use the green data cable, which plugs into the audio jack of the phone or tablet. Plug in one 9V battery to the black barrel connector on the lower piece of the Spiker Shield.

- Connect a red clip to the back of each of the electrodes (the brass brads attached to the wood stick). The black clip is the ground for your electrical circuit and needs to be touching the person whose muscles are being recorded, they can clip it to a metal ring or bracelet, or just hold it in their hand.
- Put a little bit of electrode gel on the two round heads of the brass fasteners (you will likely only see a noise signal if you don't have electrode gel!).
- You are ready to look for the electrical signals of the muscles used to move your fingers side to side! Put the two electrodes on the back of your hand and move your finger side to side. When the SpikerShield detects an electrical signal in your muscle, you should hear a clicking sound and see the LEDs on the SpikerShield lights up. Look at the screen of the device you have hooked up to your SpikerShield, there should be a signal associated with the electrical signal associated with the muscle movement. You may have to adjust the signal you see on the screen:
   a. **For computers:** Adjust the amplitude of the signal by clicking on the + or -.
   b. **For tablets or smartphones:** Pinch with two fingers vertically to adjust the amplitude of the signal on the screen. Pinch with two fingers horizontally on the screen to adjust the time (you will want somewhere between 1 and 3 seconds).
- Now try some challenges: Can you locate the muscles that control the up and down motion of your finger? Can you locate the muscles that control the movement of your wrist?
- Once youth locate the muscles that controls wrist movement (on the underside of their forearm), have a friend move their hand (so it has the same motion, but they aren't using their muscles). What kind of EMG signal do they see? (They should not see one.)

## Part II: Neuroprosthetics

- Discuss: What is neuroprosthetics? How could people use neuroprosthetics to help them?

- Time to hook up the Claw!
    - Connect the Claw motor wire to the top of the SpikerShield, making sure the yellow side is towards the center of the SpikerShield (order of the wire is important).
    - Plug in both 9V batteries to the two black barrel connectors.
    - The rest of the wires from Part I of this activity should remain the same.
    - Experiment with the Claw. It may take a little trial and error to get the claw working. You should be able to make the claw open/close each time you contract the muscle.
    - Try using different muscles.
    - The white button changes between high and low sensitivity.
    - The red button switches between default open or closed.

If time allows, have youth come up with a simple game that requires teamwork between the person controlling the movement of the claw pincers and the person that is holding the Claw.

## What's Up?

Our brain is constantly processing information from all of our senses. Sometimes the brain takes shortcuts when it either does not have all the information necessary, or needs to quickly make sense of the information coming in. Optical illusions are pictures that provide information that either is not clear or is not complete. In this activity, youth will look at several well-known optical illusions. What can they tell us about how our brains process information?

### You'll Need

**Per team of two:**

1) **Copies of the Brain Illusions sheet (pg 3 of this activity)**
2) **A white notecard with a picture on it**
3) **A magnifying glass**
4) **Paper**
5) **Markers/pencils/pens**

## Smart Start

Youth can do this activity independently. Set up several stations containing all materials. Next to each optical illusion, set a note card with the type of optical illusion it is from the list provided below.

## Here's How

**1: Introduce optical illusions.** Ask youth: Have you ever heard of optical illusions? What are they? How can they trick your brain? Tell youth that this activity will challenge them to focus on different ways that eyes send information to the brain. In each of these cases, the brain gets an incomplete picture from the eyes and has to fill in information.

**2: Tell youth** they are going to be learning about five different types of optical illusions. They will examine each illusion, and learn about the reasons why your brain fills in the information it does. Have youth visit each station to examine each of these illusions, and then talk about what is involved in each illusion:

a. **Inverted image:** Using your magnifying glass, look at a note card displaying an image a few inches from your face. The image should be focused. What do you see? The image looks upside down! The magnifying glass is acting in a similar way to our retinas. When light enters our retina, the image it processes is upside down. Our brains correct the image so that we then see images correctly.

b. **Filling in:** Follow instructions for the Vanishing Spot. What happens to the black circle? The space in the black line? Our retinas have a 'blind spot' where our optic nerve connects our eyeballs to our brains. There are no receptors in this part of the eye. Yet we still see full pictures! Our brain guesses what we should see, and fills in the rest of the picture based on this guess.
c. **Grouping:** Look at Figure 1 on your Brain Illusions sheet. How are the dots arranged? Across? Up and down? Why do you think that? Our brain organizes images based on many factors, including distance. Therefore, the lines look like they are organized in vertical or horizontal rows, because of the spacing between each dot.
d. **Figure vs ground:** Look at Figure 2 on your Brain Illusions sheet. What do you see? A vase? Two faces? Or does the image switch between the two? Our eyes can only concentrate on one figure at a time. When two exist at once, like in this picture, our brain decides which to concentrate on, and ignores the other.
e. **Context Clues:** Look at Figure 3 on your Brain Illusions sheet. Which row looks concave (the circle curves inward) and which looks convex (looks like a full circle). Imagine the light is coming from above, and then from below. Does that change how each row looks? Our eyes see things in two dimensions, and our brain changes these objects to three dimensions. It does this by looking a depth, distance, and light/shading. Without being able to know all this information, our brains can make mistakes.
f. **Context Clues:** Look at Figure 4 on your Brain Illusions sheet. Which square is in the front of the cube? How do you know?

**3: Divide youth** into pairs and introduce the challenge: Now that youth have tried several different types of optical illusions, can they create an illusion themselves? If youth are stuck, have them reexamine the previous illusions. They could, for example, group shapes in different ways, or create an image that holds two different pictures. Give youth time to plan and create an optical illusion. If a group finishes quickly, have them create more!

**4: Do a gallery walk** and try out all optical illusions. Have youth see if they can identify the type of illusion. How do they know?

**5: Wrap up.** What illusions did you find most interesting? Why? What do these illusions tell us about how our brains process information?

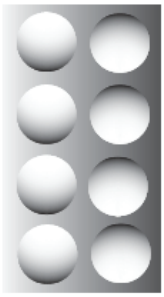
**1.** Hold this sheet about 18 inches from your face. Close your right eye. Stare at the x using your left eye. Move the sheet back and forth slightly. What happens to the black circle?

**2.** Close your right eye and try again, this time focusing on the triangle. What happens?

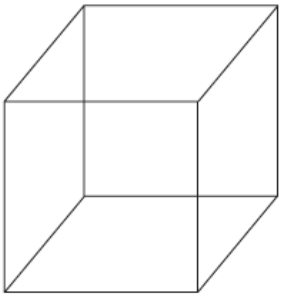
**1)**

**2)**

**3)**



**4)**



Courtesy of Bioed Online

## What's Up?

The human brain is an amazing organ, constantly analyzing and interpreting the world around us. Often, when we are presented with two stimuli at the same time, interference occurs, and our brains become confused. The "Stroop Effect" was named after psychologist J. Ridley Stroop, who discovered that when we experience multiple stimuli our reaction times can change. This activity will challenge youth to explore what happens when they try to complete two simple tasks at the same time.

### You'll Need

For each small group:

1) Pencil and paper
2) Markers of different colors
3) Stopwatch or timer
4) 45 minutes

## Here's How

**1: Discuss.** Share the Stroop Effect information above with youth, asking them if they ever get confused when they try to pay attention to and process two different inputs or stimuli at the same time! Tell them that scientists use a Stroop Test to study how the brain reacts when it gets these "mixed messages."

**2: Research.** Start with the original Stroop Test to explore how it works. Find a copy of the two pages of this test at the end of this lesson.

**3: Try it!** There are two rounds to this activity. Have your youth work in pairs, with one person using the stopwatch to time the other while they complete both rounds. Then ask the youth to switch roles and repeat.

- **Round 1:** Look at the list of words on Image 1 and identify the colors of the words out loud, one at a time.
- **Round 2:** Repeat with Image 2.

**4: Compare times.** Which list was easier to read? Why?

**5: Brainstorm.** Explain that when you are looking at the list of words in Round 2, your brain is getting mixed messages. Deliver the challenge: Explore how reaction time differs when testing different types of "mixed messages." Challenge youth to make a list of different stimuli to test (e.g., color and shape, color and words, color and animal, number and animal).

**6: Test.** Have each small group create new test sheets using the stimuli they chose. Remind them to time how long each task takes and record.

**7: Analyze and share findings.** As a large group, discuss these questions: Did you get different reaction times when testing different stimuli? Which stimuli were more difficult than others? What implications do these findings have for everyday life?

**8: Continue exploring.** Try out the activity with friends and family. Do you get different results based on age? How about if you are in a noisy environment?

Activity used with the permission of Dr. Eric H. Chudler, Neuroscience for Kids, University of Washington.

## What's Up?

When we are very young, we learn basic skills like walking and reaching. Later, we use these building blocks to tackle more complex skills, like writing, playing sports or dancing. Such learned movements are stored as motor programs in the cerebellum, which is located at the back of the brain. This type of "how-to" memory, called procedural memory, often is difficult to describe in words. Repetition is important for making procedural memories. It is often said that "practice makes perfect." That may not always be true, but as we will see here, practice makes memory.

### You'll Need

1) Pencil
2) Small unbreakable mirror
3) Copies of the "Mirror Work" page
4) 30 minutes

## Smart Start

Discuss procedural memory. What are some activities that require it? (Examples include walking up the stairs, ice skating, driving a car, etc.) What would happen if we were not able to learn and improve our physical skills by practicing?

## Here's How

**1: Give** each youth a copy of the "Mirror Work" page and a small plastic mirror.

**2: Have them hold** the mirror so that the reflection of one of the shapes on the "Mirror Work" page can easily be seen.

**3: Instruct youth** to draw a line between the border lines of each shape as accurately as possible, while looking ONLY in the mirror. Youth may choose the sequence in which they draw the lines on the rest of the shapes.

**4: Have youth compare** their first efforts with their last. How was it to draw the lines the first time compared to the last time? Why do you think that changed?

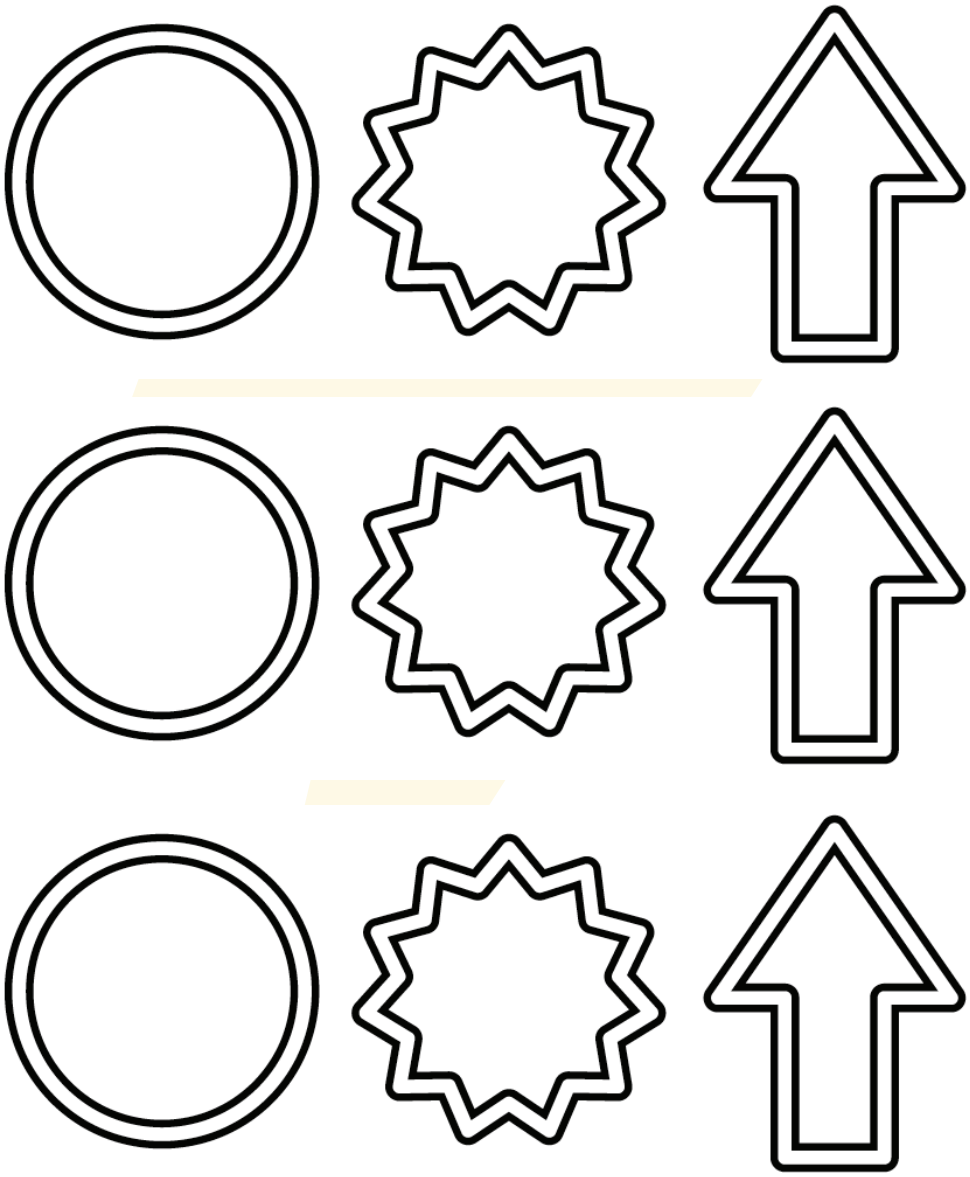
**5: If time permits,** allow students to practice their mirror-drawing skills over several days. Have them test their skills again and ask: Was the mirror-drawing easier this time than the first time you tried it? What kind of memory have you formed?

## Mirror Work

**1: Hold your mirror** so that the reflection of one of the shapes can be seen easily.

**2: Keep your eyes** only on the mirror image as you draw a line in the white space between the outer black lines of the shape.

**3: Repeat** for each of the shapes below.



## What's Up?

To multitask or not to multitask, that is the question! Scientists are divided over whether multitasking is or isn't effective. One theory says that people can only multitask if they are really good at both tasks, while another claims that we don't actually multitask—instead, our brain just switches between tasks. However, most scientists agree that performance on any activity is lower while multitasking than it is when people do just one thing.

### You'll Need

1) Worksheets (see Smart Start below)
2) Pencils and paper
3) Stopwatch or timer
4) Multimedia devices (e.g., cell phones, computer, TV)
5) Internet access
6) One hour

## Smart Start

Compile several short worksheets in math, reading, science, etc., including the answers. Many websites have free printable worksheets, such as www.schoolexpress.com/fwsindex.php. If you have youth of differing ages, make sure to provide worksheets for each grade level.

## Here's How

**1: Break** into small groups.

**2: Introduce or define** multitasking. Explain that questions exist about whether people can really multitask and if it is beneficial to multitask. Ask youth: Do you routinely multitask, and if so, how? Do you think you're good at it? Then, deliver the challenge: Does multitasking by engaging with media (like TV, social media, music, etc.) while working on homework affect your ability to successfully complete the homework?

**3: Brainstorm.** Break into small groups and ask youth to brainstorm media tasks that they engage in while doing homework. At least one youth in each group will be tested on the worksheets, so you may want to group youth who are comfortable having their work "graded" with youth who aren't.

**4: Plan.** Ask youth how they think homework completion changes with media multitasking. Design your own experiment to test multitasking ability. Here are some things to consider:

- Types of media tasks
- Number of worksheets to complete
- Homework subject (youth should complete a new worksheet with each test)
- How many people will participate in the activity (sample size)
- How to measure success (for example, time or number of correct answers)

**Note:** This is a great activity to point out the purpose of controls. A control experiment serves as the standard by which to compare the multitasking results. In this experiment, the control is completing a worksheet in silence, with no media distractions.

**5: Encourage predictions.** Predict which media tasks will be easy or hard to perform while doing homework, or rank media tasks from least to most distracting. Then, start testing!

**6: Communicate results.** Have each group create a presentation of their data. How did results compare to predictions? Do results differ with worksheet subject? Discuss whether youth think it's helpful for them to multitask with media and homework.

**7: Continuing exploring.** How does multitasking ability change with age or gender? Create a survey to collect information and then design another experiment to find out!

## What's Up?

Declarative memories involve things we have learned about people, events, and facts, and are processed using the hippocampus (located near the center of the brain) and prefrontal cortex (located at the very front of the brain, behind the eyes and forehead). Procedural memories involve things we have learned to do, like riding a bike, cooking, or putting on shoes. The brain stores declarative and procedural memories separately. There are many strategies for improving performance around declarative memories, including mnemonic techniques.

### You'll Need

**Materials (per group):**

1) Paper
2) Writing utensils
3) A tray or plate
4) 20 small random items (buttons, screws, marbles, coins, small toys)
5) 30-45 minutes

## Smart Start

Before starting this activity, prepare one tray with 20 random items for each group. Each tray should have a different assortment of items. Groups will be rotating trays during this activity. Take a photo of each tray, to use as a reference later in your program (see follow-up).

## Here's How

**1: Have youth** form small groups of equal size, and give each participant paper and pencil.

**2: Start by** discussing memory. Ask youth: What do they know about memory? What kinds of memories do you have? Share with them the definitions of—and differences between—declarative and procedural memory, and tell them that this activity will declarative memory.

**3: Now it's time** for Trial #1. Give each group a tray of items, and tell youth that they will have three minutes to try to memorize all of the items on the tray. Remind them that they will silently observe the tray, with no writing or talking allowed. After the three minutes is up, cover and collect the trays. Give youth two minutes to write down as many items as they can remember, and total them for a final Trial #1 "score."

**4: Ask students** what kinds of methods or "tricks" they use to help them recall information. Then talk about mnemonic strategies, which is the practice of assigning an easily remembered phrase or word to remind us of other information. For example, the "name" ROY G BIV is made up of letters that represent the colors of the rainbow (Red, Orange, Yellow, Green, Blue, Indigo, Violet). The phrase Every Good Boy Deserves Fudge reminds piano players of the scale's notes (EGBDF). What other mnemonic tools (like songs or rhymes) can they share?

Another memory-booster is grouping. In this practice, people "group" items by similarities, e.g. all items that are green, all items that are edible, all items that are used in crafts, etc. Then they challenge themselves to remember the groups, which can spur them to recall the individual items (i.e. in the "sewing" group, people might remember a needle, a button and a spool of thread).

**5: Now it's time** for Trial #2. Rotate the trays, giving each group a new one. Give youth the same three-minute time limit and instructions to use mnemonic phrases or words to help them remember things. Once time is up, have the youth count the items they remembered correctly. Is it higher for Trial #2? Did mnemonics help?

**6: Time for** Trial #3. Rotate the trays, giving each group a new one. Give youth the same three-minute time limit and instructions to use grouping to help them remember things. Once time is up, have the youth count the items they remembered correctly. Is it higher for Trial #3? Did grouping help?

**7: Have students compare** and discuss their results for the different trials by making a chart or graph. Are there differences between the results of the trials? What worked best? Was it the same for everyone? How is this information useful? Can you think of ways to use this in your everyday life?

**8: Discuss** that fact that declarative memories, like lists of information, facts, and events are produced using the hippocampus and cerebral cortex (outermost layers of the cerebrum). Ask students what they think would happen to the memories of a person who had part of their brain removed or damaged?

**9: Have extra time?** Invite youth to watch this five-minute TEDed video which describes the role of the hippocampus in memory: https://www.youtube.com/watch?v=KkaXNvzE4pk. Have a discussion about how brain diseases (like Alzheimer's) and brain injury can affect memory. Let students share their thoughts.

# ROLE MODEL PROFILE REFLECTION: Alex, MRI Technologist

## What's Up?

Meet MRI Technologist Alex! Alex uses Magnetic Resonance Imaging (MRI) technology to capture images of the human brain and body. These images help doctors diagnose and treat patients. Alex grew up in Cuba, and originally had a career. Enjoy this video in Spanish, with English subtitles. After watching, youth will reflect on Alex's work and life, and will think and talk about how his career ties into everything they are learning and doing in the CEREBROedu program.

### You'll Need

1) Paper and pencils/markers or whiteboard
2) Four-minute video: Alex: MRI Technologist (Visit PBSLerning-media.org, search for Alex MRI Technologist)
3) 30 minutes

## Here's How

**1: Before watching the video,** have a short all-group discussion to set the stage for learning, and to help activate youth's prior knowledge:

a. Give a brief overview of what they can expect in the video, and tell them what their goal is in watching it.
b. Ask: "This video is about an MRI Technologist; what do you think that career is like? What is an MRI and how are they used?"

**2: Watch** the video with youth (approximately 4 minutes).

**3: Have youth pair up** and discuss the video. What did they like? What surprised them? What questions do they still have? Have youth share their discussions with the whole group. Pick out important words from their answers and write them on a large piece of paper or whiteboard.

**4: Continue the discussion** with some or all of the following questions:

- Alex uses an MRI machine to help doctors learn about the brain. Do you think this would be interesting to do?
- How do the activities we have done so far help you understand what an MRI can be used for?
- How does Alex's job help people?
- What are some struggles that Alex has had while getting to this point in his career? What would you have done if you were Alex?

# ROLE MODEL PROFILE REFLECTION:
## Cori, Psychology Student

## What's Up?

Meet Cori, a student pursuing a psychology degree! Cori, a senior in college, is interested in industrial and organizational psychology, which is all about human behavior in the workplace. Following graduation, she hopes to help corporations and individuals achieve a better work-life balance. Enjoy this video in English with Spanish subtitles. After watching, youth will reflect on Cori's work and life, and will think and talk about how her career plans tie into everything they are learning and doing in the CEREBROedu program.

### You'll Need

1) Paper and pencils/markers or whiteboard
2) Four-minute video: Cori: Psychology Student
(Visit PBSLearningmedia.org, search for Cori Pychology Student)
3) 30 minutes

## Here's How

**1: Before watching the video,** have a short all-group discussion to set the stage for learning, and to help activate youth's prior knowledge:

a. Give a brief overview of what they can expect in the video and tell them what their goal is in watching it.
b. Ask: "This video is about a college student majoring in industrial and organizational psychology. What do you think that is, and what would that career be like?"

**2: Watch the video** with youth (approximately 4 minutes).

**3: Have youth pair up** and discuss the video. What did they like? What surprised them? What questions do they still have? Have youth share their discussions with the whole group. Pick out important words from their answers and write them on a large piece of paper or whiteboard.

**4: Continue the discussion** with some or all of the following questions:

- How will Cori help people in her future career?
- Even though Cori is pursuing a different career than her parents, she says she learned many lessons from them. What have you learned from family members that helps you in school, sports, or afterschool activities?
- Before you watched this video, did you know that you can have a career in business psychology? How might your ideas about what careers you can have change over time?
- Cori talks about how she has professors that she considers her role models. How do you think finding role models has helped her succeed? Do you have anyone in your life that you would consider your role model?

# ROLE MODEL PROFILE REFLECTION:
## Erica, Nurse

## What's Up?

Meet Erica, a nurse! Every day, Erica helps patients manage chronic pain by teaching them strategies to retrain the way their brain senses pain and empowers patients to create good self-care habits. Enjoy this video in English with Spanish subtitles. After watching, youth will reflect on Erica's work and life, and will think and talk about how her career ties into everything they are learning and doing in the CEREBROedu program.

### You'll Need

1) Paper and pencils/markers or whiteboard
2) Four-minute video: Erica: Nurse (Visit PBSLearningmedia.org, search for Erica Nurse)
3) 30 minutes

## Here's How

**1: Before watching the video,** have a short all-group discussion to set the stage for learning, and to help activate youth's prior knowledge:

a. Give a brief overview of what they can expect in the video, and tell them what their goal is in watching it.
b. Ask: "This video is about a nurse specializing in pain management; what do you think that career is like?"

**2: Watch the video** with youth (approximately 4 minutes).

**3: Have youth pair up** and discuss the video. What did they like? What surprised them? What questions do they still have? Have youth share their discussions with the whole group. Pick out important words from their answers and write them on a large piece of paper or whiteboard.

**4: Continue the discussion** with some or all of the following questions:

- Erica talks a lot about her family: how they have helped her, and how she has helped them. How do you think her family feels about the work that she does?
- How do the activities we have done so far help you understand about chronic pain and the brain?
- How does Erica's job help people?
- What are some challenges Erica has faced while getting to this point in her career? What would you have done in her place?

# ROLE MODEL PROFILE REFLECTION:
## Marlene, Family Therapist

## What's Up?

Meet Marlene, a family therapist! Marlene helps families to overcome mental health challenges. She frequently works with Latinx families, and she often talks about common misconceptions about mental health. Enjoy this video in Spanish with English subtitles. After watching, youth will reflect on Marlene's work and life, and will think and talk about how her career ties into everything they are learning and doing in the CEREBROedu program.

### You'll Need

1) Paper and pencils/markers or whiteboard
2) Four-minute video: Marlene: Family Therapist
(Visit PBSLearningmedia.org, search for Marlene Family Therapist)
3) 30 minutes

## Here's How

**1: Before watching the video,** have a short all-group discussion to set the stage for learning, and to help activate youth's prior knowledge:

a. Give a brief overview of what they can expect in the video and tell them what their goal is in watching it.
b. Ask: "This video is about a therapist; what do you think that career is like? Why is knowledge of the brain important in this career?"

**2: Watch the video** with youth (approximately 4 ½ minutes).

**3: Have youth pair up** and discuss the video. What did they like? What surprised them? What questions do they still have? Have youth share their discussions with the whole group. Pick out important words from their answers and write them on a large piece of paper or whiteboard.

**4: Continue the discussion** with some or all of the following questions:

- Marlene talks about how going to therapy is looked down on in her community. Do you see that where you live? What do people say about therapy or about mental health issues?
- Marlene also talks about how going to therapy as a child helped her cope with her parents' divorce. She says that talking about things helps her understand them. How does talking about problems you have with friends or adults help you understand them?
- Marlene also says that the brain is always changing. Does this mean you are born with all the smarts you have? Or does your brain change over time? How might practice and hard work help you be better at a new activity?
- What was an activity you used to find hard (riding a bicycle, learning to read, etc.)? How did practicing help you learn it more? How might you learn something new?

# ROLE MODEL PROFILE REFLECTION:
## Raquel, Psychology Professor

## What's Up?

Meet Raquel, a psychology professor! Raquel teaches and researches the brain at St. Norbert`s College in Wisconsin. As a psychology professor, Raquel studies the brain to better understand why we make the decisions we do. She also addresses the importance of cognitive behavioral therapy, a practice that helps people reframe how they think and allows the brain to create new patterns and connections. Her research helps people make better decisions. Enjoy this video in English with Spanish subtitles. After watching, youth will reflect on Raquel's work and life, and will think and talk about how her career ties into everything they are learning and doing in the CEREBROedu program.

### You'll Need

1) Paper and pencils/markers or whiteboard
2) Four-minute video: Raquel: Psychology Professor
(Visit PBSLearningmedia.org, search for Raquel Psychology Professor)
3) 30 minutes

## Here's How

**1: Before watching the video,** have a short all-group discussion to set the stage for learning, and to help activate youth's prior knowledge:

a. Give a brief overview of what they can expect in the video and tell them what their goal is in watching it.
b. Ask: "This video is about a psychology professor; what do you think that career is like? What does a psychology professor do?"

**2: Watch the video** with youth (approximately 4 minutes).

**3: Have youth pair up** and discuss the video. What did they like? What surprised them? What questions do they still have? Have youth share their discussions with the whole group. Pick out important words from their answers and write them on a large piece of paper or whiteboard.

**4: Continue the discussion** with some or all of the following questions:

- Raquel uses an EEG machine to learn about patterns in the brain that help explain why we think the way we do. Do you think this would be interesting to do?
- How do the activities we have done so far, including a brain dissection, help Raquel do her job?
- How does Raquel's job help people?
- What are some struggles that Raquel has had in pursuing a career as a professor? What would you have done in her place?
- Is this a career you would be interested in? Why or why not?
- What was an activity you used to find hard (riding a bicycle, learning to read, etc.)? How did practicing help you learn it more? How might you learn something new?

# ROLE MODEL PROFILE REFLECTION:
## Salvador, Speech Pathologist

## What's Up?

Meet Salvador, a speech pathologist! Salvador, a speech language pathologist at an elementary school, works with children to train their brains to change the way they speak. He helps children improve their speech patterns and shows how the brain is adaptable through repetition and practice. Enjoy this video in English and Spanish. After watching, youth will reflect on Salvador's work and life, and will think and talk about how his career ties into everything they are learning and doing in the CEREBROedu program.

### You'll Need

1) Paper and pencils/markers
2) Four-minute video: Salvador: Speech Pathologist
(Visit PBSLearningmedia.org, search for Salvador Speech Pathologist)
3) 30 minutes

## Here's How

**1: Before watching the video,** have a short all-group discussion to set the stage for learning, and to help activate youth's prior knowledge:

a. Give a brief overview of what they can expect in the video and tell them what their goal is in watching it.
b. Ask: "This video is about a speech pathologist; what do you think that career is like?"

**2: Watch the video** with youth (approximately 4 minutes).

**3: Have youth pair up** and discuss the video. What did they like? What surprised them? What questions do they still have? Have youth share their discussions with the whole group. Pick out important words from their answers and write them on a large piece of paper or whiteboard.

**4: Continue the discussion** with some or all of the following questions:

- Have you ever gone to a speech pathologist, or do you know someone who has? How does that person help people?
- Salvador speaks Spanish with his children at home, so that they can communicate with their grandparents, aunts and uncles, etc. Why might this be important? How might knowing more than one language help you in your life?
- In this video, Salvador says that repeating skills helps to retrain their brains. Did you retrain your brains during the activities you have been doing? How did repeating the activities help you do them faster or better?
- In addition to being a speech pathologist, Salvador is a parent and a firefighter. Do you like to be busy like this? How do you juggle multiple things in your life (school, sports, clubs, etc.)?

# NOTES