

A black and white photograph of a young boy with short hair, sitting and looking down thoughtfully. He is pointing his right index finger towards his forehead. He is wearing a light-colored t-shirt and denim jeans.

# How Our Brains Work

## What's So Important About the Brain?

Our brain can serve as a map for showing us how we learn and why we behave the way we do. Neuroscience provides a wealth of information that can help us and our children become better thinkers and healthier people.

## Why Introduce Children to Brain Research?

Children are fascinated by facts about their brains. Sharing scientific information about how the brain processes information and is wired to react under stress is a great way to introduce a challenge to your children: How can we learn to react differently, helping our brain make wise choices about our words and actions?

As children become more familiar with three key parts of the brain involved in thinking and learning, they'll begin to understand how their feelings arise—and that they have the ability to change what they do in response. This understanding lays the groundwork for them to monitor and regulate their behavior by calming themselves in the face of anxiety, focusing their attention, and taking control of their learning.

## What Can You Expect to Observe?

"Modeling their brain with their two fists not only gives children a sense of the size of the brain, but the activity also makes them more curious. They begin thinking about their brain and asking all sorts of questions. Using nicknames for parts of the brain allows us to talk about them in a meaningful way."

—Pre-K teacher

# Linking to Brain Research

## Meet Some Key Players in the Brain

The limbic system controls emotions and motivations from deep inside the brain. A key player of the limbic system is the amygdala. The amygdala is a pair of almond-shaped structures that reacts to fear, danger, and threat. The amygdala regulates our emotional state by acting as the brain's "security guard," protecting us from threats. When a child is in a positive emotional state, the amygdala sends incoming information on to the conscious, thinking, reasoning brain. When a child is in a negative emotional state (stressed or fearful, for example) the amygdala prevents the input from passing along, effectively blocking higher-level thinking and reasoned judgment. The incoming stimuli and signals are left for the amygdala itself to process as an automatic reflexive response of "fight, flight, or freeze."

The hippocampus is another limbic system structure. These twin crescent-shaped bodies reside in the central brain area, one behind each ear, in the temporal lobes. The hippocampus assists in managing our response to fear and threats, and is a storage vault of memory and learning.

Information from the limbic system is fed to the prefrontal cortex—the learning, reasoning, and thinking center of the brain. This highly evolved area of the brain controls our decision making, focuses our attention, and allows us to learn to read, write, compute, analyze, predict, comprehend, and interpret.

Learning about these key players helps children understand how their brains respond to stress and prepares them for creating a calm mind-set for thoughtful decision making, led by the prefrontal cortex (PFC).



## Clarify for the Class

Make a model to show how the brain processes information under stress. Fill a clear plastic bottle with water, an inch of sand, some glitter, and metallic mini-confetti.

# Getting Ready



## Picture Your Brain

Using an anatomical drawing and hand gestures, a teacher introduces the parts of the brain.

## GOALS

- Children identify the amygdala, the hippocampus, and the prefrontal cortex (PFC) on a diagram of the brain.
- Children will give a simple definition of these three parts of the brain.

## MATERIALS

- chart paper and marker
- "Getting to Know and Love Your Brain" poster
- Brain Power! activity sheet (p. 152)



## CREATING THE OPTIMISTIC CLASSROOM

**Classroom Management** In Lesson 2, children will learn the importance of being mindful. Lay the groundwork for children to behave in a mindful way by establishing a set of classroom rules, such as the following:

- Respect others. Treat them as you want to be treated.
- Be kind.
- Listen when someone is speaking.
- Take turns speaking.
- Ask questions when you're curious or confused.
- Stay focused on your own work when the teacher is working with others.
- Celebrate everyone's accomplishments.



how our brains work

understand  
the  
purpose

**Here It Is!**

A child shows his partner the location of his prefrontal cortex.

## MINDUP Warm-Up

### Celebrating the Brain

Expand children's thinking about their brains with the following song:

#### *My Brain Is So Very Important to Me*

*My brain is so very important; it helps me do most everything,  
Located here in my head; it's why I can think, choose, and sing.  
My brain, my brain; it is so important to me, to me,  
My brain, my brain; it is so important to me.  
My brain, it helps me think and remember; my brain tells me fight, flee, or freeze;  
It helps all my parts work together, and that's why I just have to say,  
My brain, my brain; it is so important to me, to me,  
My brain, my brain; it is so important to me.*

Write the lyrics on chart paper. Before introducing the song to children, practice singing it several times to the tune of "My Bonnie Lies Over the Ocean." Use gestures and movement to act out the words and phrases.

**Discuss:** After singing the song with children a few times, ask them to talk about what their brains help them do every day and why they think their brains are so important to them.

# Your Brain Is Showing!

## Engage

### What to Do

Review with children your warm-up activity discussion on the importance of their brains. Then tell them that exercise can help make their brains become stronger.

- We need exercise to make our bodies strong. Running and playing help us make our bodies strong. We need exercise to make our brains strong, too. Thinking helps us make our brains strong.

Explain that together the class will learn about some of the parts of the brain and what each part does. Give each child a copy of the Brain Power! activity sheet and display the "Getting to Know and Love Your Brain" poster for reference. Introduce the three key parts of the brain involved in thinking and acting: the prefrontal cortex, the amygdala, and the hippocampus.

Have children pronounce the terms with you and identify the location of each part. Ask them to point to their own head as a model (PFC: right behind the forehead; amygdala: deep inside, behind each ear; hippocampus: just behind the amygdala on both sides).

### Why It's Important

Familiarity with brain parts and their functions helps children begin to think about thinking—how they learn, remember, solve problems, understand themselves and other people. This lays the groundwork for an involvement in their own learning and social interactions.

## Explore

Have children model their brains by making a fist with each hand and putting their fists together with right and left knuckles aligned and thumbs side by side, pointing upward.

- Your thumbs are the prefrontal cortex. Think of the prefrontal cortex as the wise leader who helps you make good choices and pay attention.
- The tips of your pointer fingers are buried deep inside. They are the amygdala. Think of the amygdala as the security guard, who warns you of danger, keeps you safe, and helps you express emotions, such as anger and fear.
- The tips of your middle fingers are your hippocampus, the saver of memories. This saver of memories keeps important information and brings it back when we need it.

As you name the parts of the brain, have children wiggle their fingers to show each part. Ask them to describe in their own words what each part does.

**PRE-K CORNER:** Have children use their fists to model the size of their brain. Emphasize the nicknames—wise leader, security guard, and saver of memories.

Using visual models and nicknames to establish the names and locations of these three parts of the brain engages children, reinforces concepts in several different ways, and helps build a foundation of background knowledge for future lessons.

### From the Research

Students are more likely to remember and really understand what they learn if they find it compelling or have some part in figuring it out or discovering some part of it for themselves. (Willis, 2006)

### Reflect

To review, have pairs of children retell in their own words the function of each brain part. Guide children to draw a line connecting the name of each part of the brain to its function on the activity sheet. Encourage them to add sketches, notes, and words to help them remember what each part does.

Share a few scenarios to ensure that children can identify the brain parts and their functions.

- **Imagine this:** You are asleep. A loud crash wakes you up. How does your body immediately react? What are you thinking? How does your body feel?
- **Which part of your brain will keep you safe—** your brain's wise leader (the prefrontal cortex), your brain's security guard (the amygdala), or your brain's memory saver (the hippocampus)?

Conclude this lesson by sharing with children that future MindUP lessons will help them calm their amygdala when there's no immediate threat, strengthen their ability to focus by getting information to the PFC efficiently, and store important ideas in their hippocampus.

Providing real-life scenarios about different types of reactions and eliciting experiences from children gives them useful examples to attach meaning to. This review lays the groundwork for the next lesson, which connects mindful and unmindful behaviors to the roles of the amygdala and the PFC.



how our brains work

connect  
to  
learning

## MINDUP In the Real World

### Career Connection

If you're fascinated by the brain and how it works, you might consider a career as a neuroscientist. A neuroscientist is anyone who studies the brain and central nervous system. Within the wide-ranging field of neuroscience, there are many specialized jobs; for example, a *neuroanatomist* studies the structure of the nervous system, while a *neurochemist* investigates how neurotransmitters work. If operating on the brain sounds exciting, consider the work of a *neurosurgeon*, or, if you're concerned about diseases that affect the brain, become a *neuropathologist*. A *neuropsychologist* explores brain-behavior relationships.

**Pre-K-2 Discuss:** What do you know about the brain? What more would you like to find out? How might you do that?

### Once a Day

Take a break to self-assess: do your responses reveal the dominance of your amygdala (reaction) or your PFC (reflection)? If your amygdala is being activated, what is triggering its response? What would you like to change about your style of reaction?

# Connecting to the Curriculum

Learning about the brain supports children's connection to their own learning process and to the content areas and literature.

## Journal Writing

Encourage children to reflect on what they've learned and to record questions to explore at another time. The youngest children can keep a visual journal for their drawings and early writing efforts. Children may also enjoy responding to these prompts:

- Draw a picture of your brain. Highlight the prefrontal cortex, amygdala, and hippocampus with different colors. Then imagine a scary situation. Draw a speech balloon to each part of your brain. Write how each part reacts.
- Write about or draw a favorite memory that's stored in your hippocampus. Why do you think your prefrontal cortex saved that memory?
- Write a poem about the amygdala, the hippocampus, and the prefrontal cortex. To get started, think about these questions: Why is each part important? How do the parts work together? When does each part go into action?
- Imagine the amygdala, hippocampus, and prefrontal cortex as superheroes. Give each a name to explain its role.
- **Pre-K & Kindergarten:** Ask children to draw a picture of a time when they felt afraid. Record each child's explanation of what happened in his or her journal.



## MATH

### A Calming Countdown

#### What to Do

Counting to ten can help children deal with stressful situations. Review the numbers from 1 to 10. Then describe an unsettling event such as a sudden, severe thunderstorm. Ask children to respond immediately to it. Have them imagine the same situation. Tell them to count to ten before responding. Discuss the differences in their responses. Point out that the first time, they reacted immediately to the situation; the second time, they had the time to reflect on the situation before responding.

#### What to Say

Imagine this: You want to play with a favorite toy. A younger child takes it away from you without asking. Quick: What do you do? The next day, the same thing happens. You're playing with your favorite toy, and the same child takes it. Count to ten. What do you do?

#### Why It's Important

Counting to ten allows children to reflect rather than react to a situation that causes stress. This self-imposed time-out allows the amygdala to pass signals to the PPC. The "wise leader" will make the decision, and in the future, the hippocampus will be able to pull up a positive memory of how to successfully deal with stress, frustration, or upset.

## SCIENCE

### That's Scary! No, It's Not!

#### What to Do

Have children draw a simple happy face and unhappy face on separate sheets of paper. Pose different potentially scary or anxiety-producing situations: riding on a roller coaster, seeing a snake, participating in a dance or music recital or a sporting event, and so on. Ask children to hold up a happy face or unhappy face to show how they would respond to each situation.

#### What to Say

Let's imagine ourselves in a few different situations. How does each situation make us feel? Here's the first one: You're riding on a roller coaster. How does that make you feel? Hold up a happy face or an unhappy face. I'm going to hold up an unhappy face. I see that some of you are NOT scared of riding on a roller coaster!

#### Why It's Important

Although our brains have the same basic structure, we each respond to situations in unique ways. How our brains operate—how the parts interact in a certain situation—will differ.

how our brains work

extend  
the  
lesson

## LANGUAGE ARTS

### What's My Role?

#### What to Do

Using the back of the "Getting to Know and Love Your Brain" poster where all can see it, group children in teams of three or four. Read each question. Have each team agree on an answer. Older children can write down their answers, while younger children can give answers orally. Ask each team to reveal its answer. Post correct answers around the perimeter of the poster. Use pins or sticky tack to connect questions and answers.

#### What to Say

Read a question about the parts of the brain we've learned about: the amygdala, hippocampus, and prefrontal cortex. Each team will work together to answer it.

- The part helps us remember things' names. (hippocampus)
- The part is right behind our forehead. It helps us make good decisions. (prefrontal cortex)
- We jump away from a sudden noise. Which part of your brain is at work? (amygdala)

#### Why It's Important

As children learn more about their brains, they will find out ways to exercise the parts of their brains, especially the prefrontal cortex, which will help them make good choices, pay attention, and learn more.

## SOCIAL-EMOTIONAL LEARNING

### Take a Big Breath

#### What to Do

The more strategies a child has for calming the amygdala, the better. Deep breathing will teach children to focus their attention and relax. Have them stand more than one arm's-length away from each other with feet at hip width. Model the activity first. Repeat at least ten times.

#### What to Say

- Taking big breaths can help calm us down and focus.
- Stand with your feet apart. Cross one wrist over the other.
- Slowly breathe in through your nose. Lift your arms as they meet over your head.
- Hold out your breath slowly. Bring your arms down and cross your wrists again.

#### Why It's Important

Children need to know that they can control their responses with simple techniques, such as deep breathing. Focusing their

When Sophie Gets Angry—  
Really, Really Angry...



BY MOLLY BANG

## Literature Link

### When Sophie Gets Angry— Really, Really Angry

by Molly Bang  
(1999). New York: Scholastic.

In an angry fit, Sophie runs out of her house. As Sophie begins to notice the natural world around her, she calms down and returns home in a better mood.

After reading aloud the book, connect it to how reflecting rather than reacting can have a positive effect on our behavior.

## More Books to Share

Cave, Kathryn. (2003). *You've Got Dragons*. Atlanta: Peachtree Publishers.

Kaczenko, Cheryl. (1989). *On Monday When It Rained*. Boston: Little, Brown, and Company.

Vail, Rachel. (2002). *Sometimes I'm Bored*. New York: Scholastic.

