



“MY AMAZING BRAIN for Juniors”

My Amazing Brain for Juniors has been created, by the Centre for Studies on Human Stress, for teachers and students to discover and learn about the wonders of the brain, which is an important player in the response to stress. The Junior version of the program has been adapted for children 7 years of age (2nd graders) in order to educate them about the brain at an early stage. Education programs on stress have been developed, by the Centre for Studies on Human Stress, for children and teenagers aged 12 to 16 years. ‘My Amazing Brain for Juniors’ can thus serve as an introduction to the education programs of the Centre for Studies on Human Stress that will give the basis for a clearer understanding of the stress education programs that are available at older ages.

My Amazing Brain for Juniors is an interactive and hands-on program. It gives 2nd graders a basic understanding of what the brain does, what it's made of, as well as the important role that the brain plays in learning and memory. In addition, the program exposes 7 year olds to fundamental functions of the eye, ear and nose.

The lesson has been divided into 4 main sections.

1. **Skull & Brain**
 - Cerebrospinal Fluid
 - Neurons
2. **Ears & Nose**
 - Hearing
 - Smell
 - Neuron chain
3. **Eyes**
 - Sight
 - Can Your Brain Trick You?
 - Optical Illusions
4. **Learning & Memory**
 - Short-term & Long-term memory
 - Recall/Memory trick

In this booklet, we have included the outline of the lesson plan, as well as the Teacher's Lesson Plan that includes all the details and instructions to carry out the activities and experiments.

Have fun exploring your amazing brain!

Sonia Lupien, Ph.D. Scientist

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And all the students of the Centre for Studies on Human Stress that contributed in the piloting of this project in the schools.

OUTLINE of Lesson:

1. Skull & Brain:

- To demonstrate the functions of the *Cerebrospinal Fluid*, the “Mr. Egghead” experiment will be carried out using raw eggs! The experiment will show that the cerebrospinal fluid and the skull protect the brain from sudden impact. Kids love this experiment.
- What's the brain made of? Kids will discover the importance of neurons. The entire class will participate in the Chain Neuron activity.

2. Ears & Nose

- Kids participate in activities that demonstrate how the brain knows that it's heard a sound and that there's a smell out there!
- Kids take part in an experiment that is designed for them to explore whether people vary in their ability to match unlabelled containers of odor material.

3. Eyes:

- The role that eyes play in seeing, are explained with a fun exercise that the kids are bound to enjoy.

* Can Your Brain Trick You?

Optical Illusion: What you see is not always what is there. Or is it?

4. Learning & Memory

- The difference between short-term memory and long-term memory is explained.
- Students do an exercise to see just how good their memory is!
- Kids will be taught tricks on how to remember a list of things in a fun exercise that they will surely discover to be lots of fun.

--Break--

Question & Answer period.

Teacher's Lesson Plan

The Teacher's Lesson Plan is a detailed guide for the lesson. The text, written in black, is for you to read to your students exactly as it is. But with experience, you may use this text simply as a guide.

This document is organized by various topics on the brain. Activities pertaining to the specific functions of the brain are included in order to get the kids involved. The activities and exercises are very interactive and involve all students in the class. (See pg.12 for a list of materials needed for the entire lesson). The document provides instructions for each of the activities, as well as questions that you can ask and discuss with your students.

We hope this serves as a helpful guide to you. Now you may begin exploring your amazing brain!

Introduction

SKULL & BRAIN:

Pinch your nose. Wiggle your toes. Lift up your right leg. Think about your favorite movie, and try to remember the last time you saw it. Now place both hands around your head. What do you feel? Something hard?

That's your skull. And what do you think is inside?

{Slide: Skull and Brain}

Inside your skull is your brain. Your brain is the control centre for everything you do; pinching your nose, wiggling your toes, running, breathing, remembering.

Today we are going to learn lots of fascinating and fun facts about your brain. But first, let me ask you this. What do you think is inside your skull? Your brain! That's right.

Inside your skull is your brain. But is your brain really alone inside your skull or do other things surround it? To discover whether your brain is directly under your skull or if other things surround it, we're going to do the Mr. Egghead experiment.

Mr. Egghead Experiment - Cerebrospinal Fluid

You will need:

- Eggs (at least 2)
- Marker to draw on a face (waterproof)
- 2 plastic containers with top
- Water (to fill the container)

(From Dr. Chudler's Neuroscience for Kids)

This egg represents the brain. And the plastic container represents the skull. (Place the egg in the plastic container and close the lid). Now, let's say that I take the stairs, and I fall. My brain will surely shake inside my head, don't you think? Let's try to see what will happen if I shake my brain inside my skull. If I shake the container, you'll see that the egg will break. (Shake the container). Now the brain has been damaged. Oh no! This would mean that if there's only

my brain under my skull, each time that I bang my head, my brain would become like Mr. Egghead here! It doesn't make sense. This means that there must be something else that surrounds the brain.

Let's take another egg. (Place another egg in a plastic container) This time, let's try to think of a way to protect the brain so it doesn't break. Can you think of a way? How about we put some water into the skull together with the brain? Do you think that will help to protect the brain from breaking? Let's try. (Pour some water into the plastic container and close the lid). Now I'm going to shake the container to see what happens when the brain is surrounded by water. (Shake the container or ask a student to shake it. If you like, you can also ask more than one student to shake the container to see if Mr. Egghead will break). The egg did not break! How come? This is because the water is protecting it, acting like a cushion. In the brain, there is a type of water called the Cerebrospinal Fluid that helps to protect the brain from sudden impacts. So, from this experiment, we know that both the Cerebrospinal Fluid and the skull surround the brain, and also protect the brain. But even though we have the Cerebrospinal Fluid protecting our brain, it is still very important that we wear a helmet each time we go biking, or skiing, or rollerblading. Your brain is very precious and you must take good care of it!

What's the brain made of?

Now that we know what helps to protect your brain, let me ask you another question. What do you think the brain is made of? (Some examples kids have given us: blood, muscles, fat). When you look at a brain, it is a bit squishy. This is because the brain is made of millions of very very small things called 'neurons'. A neuron is like a post office. Just like the post office, a neuron receives a message from someone (another neuron), and sends the message to someone else (another neuron). Do you want to make a neuron with me?

Have the children stand up and place their hands straight on each side of their body (like a cross). You then tell them: My left hand is like the part of the neuron that receives the information from another neuron. Then, the message gets through my body (you can shake your body to show that the message gets through you) and then, the message gets to my right hand, which then sends the message to another neuron.

Do you want to do an activity called the Neuron Chain?

Neuron Chain Activity

Objective: To demonstrate how a neuron works to send messages through the body and the brain.

Instructions: Have all the students stand up. Tell them they are all neurons. You can call students your "neuron friends" – they like that! The instructor pretends to give the student in the corner of the class, a message by holding his hand. This is the start of the neuron chain. The student will then continue the chain by reaching out and holding the hand of the person behind him/her. The person behind will then hold the hand of the person behind him/her while continuing to hold hands with the person in front. Each time students hold hands with a person, he or she should shake his or her body to mimic the message that goes through the

neuron. The chain continues until all students in the class are holding hands. (Explain the activity to the students before you actually start to do the chain. This way, the instructions are clear to each student).

{Slide: Neuron Chain}

This is how a neuron chain works. One neuron receives a message from another neuron, and then it sends the message to yet another neuron. This is how information travels through your brain!

But what kind of information do you think travels to your brain? Well, there are sounds and smells, for example.

EARS & NOSE

What do you think we need in order to hear?

Answer: We need an ear, a brain...and hairs!

And what do you think we need in order to smell?

Answer: We need a nose, a brain...and hairs, as well!

Yes, yes! Both the ear and nose contains some small hairs. If you don't believe me, look into the ear of one of your friend and you will see some hair (let the children get up and look in the ear or nose of one friend).

{Slide: Nose Hairs}

Everyone has hair in his or her ears and nose. At the end of these hairs, into the skin of your ear, there is a cell, which is a like a little 'button' that is pushed down when the hair is moved. When a sound gets into your ear, it moves the hair, which then pushes the button and sends a message to your brain that there is a sound out there. Then your brain tells you what sound it is. Cool eh? The same thing happens to the nose. When there is a smell in the air, the hair is moved, which then pushes the button and sends a message to your brain that there is a smell out there. Then your brain tells you what the smell is!

Are you ready to do an activity? We're going to do two fun activities that show how your brain knows that you have heard or smelled something. Is everyone ready?

I'd like you all to stand up and let's be a neuron again with your arms out to your side! Remember, you receive the message in your left hand, the message gets through the body (shake), then the message gets through the right hand, which then sends a message to another neuron, until the message reaches the brain!

The SOUND activity!

Objective: To demonstrate how the brain knows that a sound has been heard.

Instruction: Ask all the children to stand up. They will be most likely to be sitting in rows (one student desk behind the other). The person at the front of the row is the EAR. The person sitting behind 'THE EAR' is 'THE HAIR'. And at the end of each row is 'THE BRAIN'. Everyone else are NEURONS.

First, you whisper the word 'banana' in the ear of each child in the front seat. Ask them to wait until you have finished doing this with each child in the front seat. Then get them to start the chain. When you say 'GO', have the first child in the row, (who is 'THE EAR'), whisper to the child behind them (who is "THE HAIR") the word "banana" in his/her ear. Once 'THE HAIR' hears the word "banana", he/she has to shake his/her body to show that the hairs in the ear have moved. 'THE HAIR' then whispers the word "banana" in the ear of the student sitting behind him/her, while tapping his/her hand on the student's desk. The tap on the desk is to show that the "touch button" (neuron) has been pressed, and so the message is now being sent to the brain. The child then whispers the word "banana" in the ear of the person behind him. The chain continues until the last child in the row (who is "THE BRAIN"), has been whispered the word "banana" in his/her ear. The last child to get the whisper has to say the word aloud (like the telephone game). If the word, mentioned by "THE BRAIN" is "banana", then the neuron chain worked well!

Class, this is exactly how a sound or a word, in this case, the word "banana", gets into the brain! The ear hears a sound. When the sound enters the ear, the hairs in the ear move, then the message is sent to the brain through neurons. A piece of information gets into the ear, and through the chain of neurons, this information travels to the brain to tell you what you heard!

To make things more exciting, you can get each row to compete against each other. The first row to have successfully passed on the message of "banana" to the last person in their row, wins! (There's a catch: In order to be declared the winning team, "THE HAIRS" must remember to shake their bodies and tap the desks of the person behind him/her when they have received the message – otherwise the message cannot be sent to the brain!)

Did you have fun? Ok, now let's do a similar experiment, but this time, with smell. This will be a bit more difficult!

The SMELL activity

Objective: To demonstrate how the brain knows what smell is out there.

**Before starting this experiment, ask for 4 volunteers (if you have 4 rows). These volunteers, who will now be "THE NOSE" will exchange places with the students who were "THE EARS" from the previous activity. You will then ask for another 4 volunteers (if you have 4 rows), and these volunteers will exchange places with "THE HAIRS".

Instructions:

Tell class: I have a small jar (hold up jar so they can see it), with something inside. I am going to give the first person in each row a jar. Once again, we are going to show how neurons receive and pass on a message and how information travels to the brain.

The first person in the row is "THE NOSE". "THE NOSE" smells the jar and then passes the jar to the person behind him/her, who is "THE HAIR". Have "THE HAIR" smell the jar. Ask the class, "what does the hair do when it receives a smell?". That's right, it moves! "THE HAIR" needs to shake his/her body to show that the hairs in the nose have moved. 'THE HAIR' then passes the jar to the person behind him/her, while tapping his/her hand on the student's desk. The tapping of the desk is to show that the "touch button" (neuron) has been pressed, and so the message is being sent to the brain. They continue this until the last person in the row ("THE BRAIN) says, out loud, what they think is in the jar.

That was fun! This is exactly how the brain knows what smell is out there! The nose smells something, the hairs in the nose move when the smell gets in, then the message is sent to the brain through neurons. A piece of information gets into the brain, and through the chain of neurons, this information travels to the brain to tell you what you smelled!

Now you know that all types of information – including smells and sounds - are sent to the brain, through a chain of neurons.

{Slide: Neuron Chain & Ear, Nose & Eyes}

Other than hearing and smelling, what other types of information does your brain receive? Yes, that's right! It can see everything around you and it has the job of telling you what it is that your eye sees!

EYES:

Let's say you're walking in the park and you see lots of flowers. However, out of all the flowers, a beautiful pink flower has caught your attention. The picture of the pink flower is sent to your eye. Your eye sees the flower the correct way, and the amazing thing is that when the image is sent to your brain, the image is upside down! It is the brain's job to turn the image right side up and then tell you what you are looking at.

{Slide: Eyes sees image upside down}

Do you know why little newborn babies smile and laugh when you look at them? It's because a newborn baby sees the world upside down, since it takes some time for the baby's brain to learn to turn the picture right-side up. So once the message is sent to your brain, your brain turns the picture the right side up and your brain tells you, "it's a flower that you see!"

{Slide: Baby sees image upside down}

Sometimes, the brain and the eyes have problem understanding each other and this can cause some problems.

Let me give you my first story: Do you want to hear it?

This is a true story! Listen well. There was once a man who had a problem of communication between his eye, and his brain because of a problem with his neuron-chain. What his eyes were seeing...was not the same thing as what his brain was seeing! So, when taking a walk on

the street, he would tap every fire hydrant he saw while saying, "Good child". This man's brain thought that the fire hydrants were small children! His eyes saw the fire hydrant, but his brain told him that this was a child! (Note: the scientific name for this disorder is 'agnosia').

Or, when someone showed him a pair of glasses, he would say that it was a bicycle! The information of two circles with a line in the middle would get to his brain through his eyes, but the brain would make big mistakes at deciding what it was! Try to imagine your life with such a problem!

Sometimes your brain can also play tricks on you! Would you like to see how?

* Can Your Brain Trick You?

Sometimes the brain can get a little mixed up and send you weird messages. And because your brain likes to be in order and not to be mixed up with all sorts of things, it can also trick you! This is called an illusion.

Do you want to have an illusion? Look at the picture.

Optical Illusion {Slide: Turning wheel}

"Is the Wheel Turning?"

When you keep looking at the image, it seems to be moving before your eyes. But there is no movement in the picture. How could this be?

It's because of the slight movements in your eyes that are done constantly in order to keep a sharp image sent to your brain. Look at your friend's eyes. Do you see that it is always doing some small movements - from left to right? Every human eye does that! The eyes move in order to send the best possible picture to the brain, using various angles and directions. However, because the eyes makes these movements, when it looks at arrows pointing in one direction, the slight movements of the eyes send the message to the brain that the arrows are moving, when they are not!

The same illusion can happen when you are in your parents' car. Your parents' car is at a stop, but if the car beside your parents' car starts moving, you will have the feeling that it is you who is moving! This is an illusion caused by a mixed message of your eyes sent to your brain!

OK, today, I will finish my wonderful journey through your amazing brain by talking to you about memory.

LEARNING & MEMORY:

What is memory? (You can ask the question to the students in order to see what they think of memory)

Memory is the capacity we have to remember things that happened in the past, or that will happen in the future.

Question #1: What did you have for breakfast this morning? This should be an easy question to answer.

Question #2: What did you have for breakfast 4 days ago? Mmmh... This should be a more difficult question to answer.

Why? Because there are two types of memory, one that is called short-term memory that helps you remember what happened within the last day or so, and one called long-term memory that helps you remember things that happened a long time ago, such as your last birthday party when you had this great gift.

Do you think you have good memory?
Let's find out!

{Slide "Do you think you have good memory?"}

Memory Activity:

Objective: Allows students to see how well they can memorize things.

Instructions:

Show the slide of 15 pictures to the class for 25 seconds. Within that time, they must try to remember as many objects as they can. Once the 25 seconds have passed, remove the slide so that students no longer see the objects. Ask students in the class to name the objects they were able to remember. You can ask a first student, and when he or she cannot remember more, ask for other answers from other students until you get all the 15 pictures.

(From Dr. Chudler's Neuroscience for Kids)

You all have excellent memory!

How were you able to remember all those items once the pictures were taken away from the screen? Did you see them in your head? Yes? This is interesting don't you think! Indeed, each time your brain learns a new thing, it likes to create a picture of it in your head, like a photograph!

And when you take a photograph of something, what do you do? Yes! You put this photograph in your photo album! This is exactly what the brain does! Your memory is your photo album with all the photographs that you take!

So, in order to help you remember and learn things, your brain tries to associate this new picture with older pictures you already have in your photo album. So my friends, let me give you a trick. The best way to learn something is to try to link what you want to learn, with something that you already have in your brain (in your photo album) – i.e. you have to try to link what you want to learn...with something you already know.

Let me give you exercises.

We have found that children this age are fascinated by memory, try the following exercise.

Grocery List Exercise

Objective: To demonstrate that memory is enhanced by associating items to something you already know well.

Instruction: Your dad is going to the grocery store and he has asked you to help him remember what he needs to buy. He needs you to remember to buy 3 things:

1. Tomatoes
2. Milk
3. Bread

I am going to give you a trick to help you remember these things. Again, you have to associate each one of these items with something you know very well. What is it that you know very well? Your house! Yes! Can anyone describe his or her house to me? (Have one child describe their house). You know your house very well, so let's try to associate each one of these three items to one room in your house!

In your mind, I'd like you to imagine that you're in your house and you are walking into your bedroom. And you are going to put the tomatoes on...your bed (or let the children propose a specific location that is weird, funny etc)! Now, let's go into the bathroom. Walk into your bathroom, and you're going to put the milk...in the toilet! We now walk into your parent's room, and put the bread...in their closet!

Let's see if you remember where the 3 items are. What's on the bed of your bedroom? That's right, tomatoes! What's in the toilet of your bathroom? Milk, that's correct! And what's in your parent's closet? Bread! Great job. (Note: If it is the teacher that is giving the program, we suggest that the teacher asks the children to remember the three items with the help of the rooms one week later. The children should be able to remember these three items very easily now!)

You were able to remember, because you made an association with the items to something you know well – your home! Remember, this is what your brain likes the most, to learn. By making associations, you were helping your brain to learn.

---Break if the part above went fast, or the presenter may stop the lesson completely if the part above went slow, and you have no more time---

If the presenter wishes to continue, you may begin the question period: This break allows students to pose questions that they may have. It gives the instructor a chance to clarify certain issues and/or answer students' questions on new topics. It also allows instructors to answer questions using various experiments listed below that are not in the initial lesson plan. Please refer to the section, "Questions & Answers" below for ideas to help answer the kids' questions. The sections are divided by topic for easy referencing.

Extra Fun Activities

If you have time left in your class, this section should be given 15 minutes before the end of the lesson.

* Can You Trick Your Brain?

OK. Your brain can trick you but you can also trick your brain without being able to control yourself!

Experiment: Stroop Effect

Objective: To show that you are able to trick your brain!

Instructions: Are you a good reader? The better you are at reading, the better you will be at tricking your brain in the next experiment. I will show you words on the screen, and your task is to tell me as fast as possible (you have to go fast!) what is the color of the ink I used in order to write the words. For example, you can see the word 'table' written in red, and you would have to say 'red' as fast as you can. Are you ready?

Present the 'neutral' Stroop words (e.g., table, etc) and ask the children to name (altogether) the color of the ink used to write these words.

{Slide: Words of objects}

Wow! You are very good! Now, let's do it again!

Present the 'color' Stroop words (e.g., blue, etc) and ask the children to name (altogether) the color of the ink used to write these words.

{Slide: Words of colors}

Boy, this is difficult isn't it? Why? It is because you are a good reader and you are faster at reading the words than your brain is at identifying the color of the ink. So you win over your brain! Because the words you read are all words that represent colors, you can trick your brain and read the word before you get to name the ink.

Try this task with your parents! You will see that it works very well and that they will not be able to tell you why this happens! But you will!

Materials Needed & Budget Required

Overhead slides (13 slides) (Centre de conception et d'impression Kwik Kopy) 538 Avenue Meloche Dorval, Quebec H9P 2T2 Tel: (514) 636-0120	\$24.50 (approx. \$1.65 per slide + tx)
Mr.Egghead Experiment	
2 eggs (at least)	\$ 0.50
2 Plastic Tupperwares	\$3.00
Scent-in-a-Jar	
12 salt/pepper shakers	\$7.00
Items you want to put into the containers (ex. Orange peel, lime peel, garlic, coffee)	
Total Budget Needed	\$35.00

Questions & Answers

Q: How come we can't smell when we have a cold?

A: When you have a cold and your nose is stuffed up, you cannot smell very well. This is because it is difficult for your little buttons at the end of the hair in the nose to be pushed down in order to send the message that there is a smell.

Q: Why do we smell things?

A: Why do you think we have the capacity to smell things? Yes, that's right! In order to enjoy the good smell of flowers or cake! But can you think of another reason why we would need smell in our lives?

Smell can help us survive and this is why it is so important. For example, if there is a fire in the house, you will be able to smell the fire, which will then tell you that you have to get out of the house.

Another role of smell is to help us taste food! You don't believe me? Let's try the skittle experiment!

Skittles® experiment:

Give a Skittles® to your students and have them keep it in their hand until the entire class has one. As they enjoy the taste of the candy, get them to pinch their nose. They will soon discover that while pinching their nose, they are not able to taste the candy anymore! This activity demonstrates exactly what happens when you have a cold and you cannot smell very well - the molecules that carry smell cannot reach the olfactory receptors. Also, this activity shows you that smell helps you taste, because the two activities are closely related in the brain. This is why when mom's food smells good, it will surely taste good!

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Q: How do we taste food?

A: You are able to taste food with your taste buds. But do you need to see food in order to know what you taste?

Sugar & Lemon Activity:

Let's try it out! I would need one volunteer. (Ask the volunteer to close his/her eyes. Place a drop of lemon on the volunteer's tongue. Ask him/her to identify what it is. Then, place some sugar on the volunteer's tongue. Ask him/her to identify what it is. In both cases, he will probably be able to identify what the tastes were without seeing the food that he-she puts in his-her mouth.

Class, how did he/she know that I had placed lemon juice and sugar on his tongue? It cannot be because he-she had his-her eyes opened, since they were not!

That's because, on your tongue, you have little taste buttons (called 'taste buds') that are everywhere on your tongue. In order to taste food, you first have to put it in your mouth. Once the food is in your mouth, it will for sure touch your tongue and when it does, it pushes the taste-button which then sends a message to the brain that something tasty was eaten.

Q: How can your eyes tell when something is near or far?

A: It is because your brain has depth perception that you can judge the distance of things around you.

Depth perception is very important. Indeed, when you have to cross the street, and you see a car coming, you have to decide whether it is far enough so you have time to cross, or whether it is too close and you should wait.

Depth Perception Activity:

Two eyes are better than one, especially when it comes to depth perception. Depth perception is the ability to judge objects that are nearer or farther than others. To demonstrate the difference of using one vs. two eyes to judge depth, hold the ends of a pencil, one in each hand. Hold them either vertically or horizontally facing each other at arms-length from your body. With one eye closed, try to touch the end of the pencils together. Now try with two eyes: it should be much easier. This is because each eye looks at the image from a different angle. This experiment can also be done with your fingers, but pencils make the effect a bit more dramatic.

(From Dr. Chudler's Neuroscience for Kids)

Q: Why is it that some people are deaf?

A: Does anyone here have a friend who cannot hear sounds? Let the children discuss freely with you (hands up for comments or questions) and tell you some hypotheses they have as to why their friend cannot hear sounds.

Well, there are many reasons why your friend cannot hear sounds, but one of them is that when the hair in the ear of your friend is moved, this message is not sent to the brain.

Q: Do we really need to have a sound around us in order to hear something?

A: In order to hear something, the sound must enter your ear and move the hairs in your ear. If a sound enters your ear and doesn't move the hairs, you won't hear a sound.

Let's do an activity to see how it works!

Gently place your finger in your ear. Now wiggle it around. What happens? You 'hear' something? Funny sounds? Now, does your partner hear this sound? No? Now stop moving your finger and keep it still. What do you hear now? Not much, right? Do you know why?

The answer is that when you say a word or make a sound, when you blow some air in your friend's ear, or when you wiggle your finger inside your ear, you are moving those little hairs that are in your ear. When the hairs move, they push that button that sends the message to your brain that there is a sound. But when you kept your finger still, none of the hairs in your ears were moving. No button was pressed so your brain didn't receive any message.

Q: How are we able to feel something when it touches us?

A: We are able to feel that something has touched us because our skin and body has neurons. Let's do an experiment to show you how the neurons in your body helps you feel touch.

Fork Activity:

You will need:

- A plastic fork (break the middle spikes of the fork so that you are left with only the 2 outer spikes).

Get a friend and place a bandana over their eyes. Gently place the fork on their upper part of their arm. Make sure both tips of the fork touch the skin at the same time. Ask your subject if he or she felt one or two pressure points. Now try it again, but this time on their hand. Ask your subject if he or she felt one or two pressure points. You will notice that your subject most probably said that he or she felt one pressure point on the upper arm and two pressure points on their hand.

Tell them that you actually placed 2 spikes of the fork each time. You will see that they don't believe you, but you know this is true! How can this be?

How can your friend feel only one pressure when you put two spikes of the fork on their arm?

The answer to this question lies in the NEURON, which is like a button in the skin that when pushed, sends a message to the brain that the skin has been touched. Now, in order for a button (a neuron) to send a message to the brain that it has been touched, it has to be touched!

There are more neurons in your hands than in your upper arm, so when you touch your hand, you have more chance of pushing a button than if you touch your arm, which doesn't have a lot of neurons (buttons). In order to understand this difficult concept, let's do another experiment.

Neuron Activity:

This activity demonstrates that there are more neurons in certain areas of the body than others – the more neurons, the more sensitive that area is to touch.

You will need:

- 2 sponges

You will need an open space for this activity. Have 3 students stand in the middle of the class (or other open space), two arm's length apart from each other. The teacher explains to the students that each one of them represents a neuron, and that each of the sponges represents the 2 spikes from the fork experiment. The teacher will then throw 2 sponges up in the air. The probability of the 2 sponges touching any of the students is small as they are far apart from each other. Neurons in certain areas of the body are not dense, and therefore, not very sensitive to touch. This is the case of your upper arm.

Now, have all the students in the rest of the class, huddle in between the 3 students. They are going to be quite squeezed together, representing a region where there is a lot of neurons! The teacher will now throw the sponges up in the air. With all the students in the middle of the class, the sponges are most certain to hit at least one of them! This shows that in certain areas of the body, there are more neurons, and these parts are more sensitive to touch. This is the case of your hand, and it is why you felt the two spikes from the fork (like the 2 sponges) on the hand, but you only felt one on the upper arm.

Q: How do we keep our balance?

A: The cerebellum is responsible for balance. It controls & coordinates movements of muscles such as walking, dancing, and running. The hairs in your ear help you hear things but they also help you keep your balance. But the hairs that help you keep your balance are all the way inside your ear, in the back of your ear. You can't see them. When these hairs are moved, they send a message to the cerebellum that you have moved.

The hairs way back in the cerebellum are in water.

Try to imagine an aquarium with algae in it. The algae are straight up when the aquarium is not moving. When you are standing and not moving, the hairs in the water of your ear do the same, they don't move.

But if you move the aquarium, the algae in the water will also move slightly to the left or right. This is exactly what the hair in the water of you ear will do when you move. If you bend your head to the side and down a bit, then the water in your ear will move, pushing the hair to move as well. When the hair in your ear moves, it sends a message to your cerebellum that you have moved!

And sometimes, your cerebellum can be quite mixed up by all this movement! Want to try it?

Balancing Activity:

Turn around in place for 10 full circles and then abruptly stop. You will lose your balance!

This is because by turning so often, the water in your ear moves a lot, creating waves. The hair in the water gets all shaky, sending all sorts of mixed messages to your brain. The brain is mixed up a bit. You see things in double and everything is all unbalanced! After a few minutes, you are fine. This is because the water in your ear has stopped moving, and the hair as well. Therefore, there are no weird messages being sent to your brain anymore!

Q: What part of the brain controls my right hand, when I write?

A: The right side of the brain controls the left side of the body and the left side of the brain controls muscles on the right side of the body.

So, if you are a left-hander, it means that you are using your right brain to write. If you are a right-hander, than it is your left-brain that helps you write.

But, is this true for everything you do? Let's try an experiment!

Left-Brain, Right-Brain Activity:

Pair up with your partner and try this experiment. Ask your partner to do the Task, and then write down which side of their body they used to do it.

TASK	RIGHT or LEFT?
Write your name.	Right or left hand?
Kick an imaginary ball	Right or left foot?
Look through a tube.	Right or left eye?
Listen through a wall.	Right or left ear?

Now compare your results with your classmates. Did you find that people used one side of their body for all the Tasks, or did they use the right side sometimes and the left side other times? Did the boys use one side more than the girls? What side of the brain did you use the most?***

***This is a trick question! Remember that the right side of the body is controlled by the left side of the brain. So what side of your brain do you think you use most?

(From Dr. Chudler's Neuroscience for Kids)

Materials & Budget Needed for 'Questions & Answers' Section

Skittles® Experiment	
Bag of Skittles®	\$1.85
Sugar & Lemon Activity	
Sachet of Sugar	\$0.50
Lemon Juice	\$1.00
Fork Activity	
Plastic Fork	\$0.50
Neuron Activity	
2 Sponges	\$2.30
Total Budget Needed	\$6.15

Checklist

This checklist is for instructors.

- Instructor's Manual
- Acetates
- A pair of shoes to change into when entering kids' classrooms (can't wear boots in classrooms during winter).
- Activity Log Book for the students – give one copy to the instructor and have him/her make copies for the students.

BOX OF ACTIVITIES

- ❖ 2 Eggs – make sure that a smiley face is drawn on the eggs before you place them in the Tupperware. Cushioning the eggs with a kitchen towel works well when transporting them.
- 2 Plastic containers
- Bottle of water
- ❖ 5 smell jars with bubble gum inside
- ❖ 3 smell jars with lime peel (remember to put the lime peel inside the jar the night before)
- ❖ 3 smell jars with orange peel (remember to put the orange peel inside the jar the night before)
- Skittles
- Lemon juice
- Sugar sachets
- Plastic fork (with the 2 middle spikes removed)
- 2 plastic sponges