K-3 Curriculum Training Guide

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Of Brains and Safety: Neuroscience for K–3

Curriculum Guide

Curriculum Learning and Behavioral Goals:

The overall goals of the curriculum are to make a link between neuroscience and safety by introducing young children to the human brain and nervous system, and to encourage habits of keeping their brains safe while having fun doing common, normal activities that children do.

In the process, this program seeks to engage young children's powerful thinking processes by focusing on their relative strengths to observe their surroundings, sort and classify what they observe, and then describe what they had learned verbally, visually, or kinesthetically. As children use these cognitive skills, they are developing the ability to think scientifically.

Key Concepts to Communicate:

1. The brain is what makes you go and what makes everything about you work.
2. You use it to make good decisions.
3. The brain can get hurt, and sometimes does not get better.
4. We need to take care of our brains because they take care of us.
5. People can study the brain. Neuroscientists are one group of women and men that uses different ways to find out how the brain makes *us* work.

Principles behind the Curriculum's Approach: How do children learn best?

As teachers certainly know, early-childhood students are naturally drawn to science. It is active and exciting just like children. Teachers recognize this link and provide science experiences that are appropriate to the cognitive development of the students. These thinking processes develop in a predictable sequence and lay the foundation for more advanced and abstract thinking when students are older.

1. *Hands-on learning* - Children learn best by doing and by using real life objects. Hands-on activities are engaging and motivating for children, and they promote curiosity. In this curriculum for example, we students examine brain samples and create brain models.

2. *Inquiry* - Science experiences are guided by questions. As answers are pursued, new questions arise. This curriculum asks questions such as: "What does your brain do?" and "Can your brain get hurt?"

3. *Multi-sensory methods* - As more senses are used, information gathering is maximized. This curriculum employs auditory, visual and tactile stimuli.

4. *Student interaction* - Having students work cooperatively facilitates the exchange of ideas. During the brain program the children interact in a full group, in small groups, and one-on-one with peers and adults. Students' observations and discoveries promote more curiosity and inquiry.

Suggested Personnel for Presenting the Brain Curriculum:

Scientists (2)
Teacher (1)
Parent helpers / teacher's aides (see adult to child ratio below)

For a Kindergarten class, a 1:4 ratio of adults to children is suggested to help students with activities, plus 1 scientist to rove and/or prepare for the next activity. Therefore, for example, a class of 25 Kindergarten students ideally would have a total of 6 adults participating.

For children in grades 1-3, the ratio of adults to children could gradually be reduced to 1:5.

Step-by-Step Lesson Plan:

Coordinating with the Classroom Teacher Prior to the Program Presentation Date

1. 1-2 weeks in advance of your presentation date, meet with the hosting classroom teacher.
2. Go over the curriculum together.

3. Please discuss goals and expectations, background information about the class, and roles:
    a. the teacher's goals and your goals for the program
    b. any portions of the curriculum that may be problematic or need modification
    c. any difficult situations or responses from children that the teacher or you anticipate
    d. how the curriculum fits with the class's overall science curriculum
    e. scientific concepts and areas of science that the children have studied before your program
    f. why this curriculum is being presented in the class now
    g. how many students and adults will participate
    h. any special needs children, and what accommodations can be done
    i. the roles and tasks during the program that you, the teacher, and other adults will carry out

4. Go over the location of equipment and activity stations:
    a. where can the laptop and Powerpoint projector be set up
    b. is there a screen in the classroom; does one need to be brought in
    c. do you need an extension cord? Is one available?
    d. is there room for the children to move around for the various activities?
    e. is any special permission needed from school, parents, etc. for the program?
    f. are water-based markers, clear tape, and scissors available in the classroom for the children?

5. Ask if there is anything else you should know?

6. Two-three days before the program, call to reconfirm everything with the classroom teacher.

Making the Presentation: Introduction to the Class

1. Introduce yourself and describe what the teacher has told you about the class

2. Assess what the children know about the human brain and keeping it safe
    a. What does your brain do?
    b. How does your brain find out things?
    c. Does your brain need exercise?
    d. How do you exercise it?
    e. Can your brain get hurt? How?
    f. Why can you brain get hurt if your head is so hard?
        i. Bring out and show a brain in a jar
        ii. What's it look like to you?
    g. Who rides a bike now? (Show of hands.) Who wants to learn to ride a bike?
    h. Do you have to wear a helmet when you ride your bike?
        (The State of Oregon requires bike riders to wear helmets if they are 16 years old or younger. But, it's a good idea if everyone who rides a bike wears one.)

Bike Helmet Demo

1. Bring out a bike helmet, with very loose fitting straps
    a. Who wears a bike helmet? Who has a bike helmet?
    b. What does a bike helmet do?
    c. If you ride a bike, can your bike helmet do that if you don't have it on?

2. Bring out two eggs and a small bucket, and paper towels
    a. Ask for a volunteer; ask her/his name
    b. Put the small bucket on the floor and discuss what would happen if we dropped an egg into it
    c. Ask if we should test that hypothesis
    d. Have the volunteer drop one egg into the bucket
    e. Examine the results: the hard shell cracked open and the soft insides got smooshed
        (If the bucket fails to catch the egg, the paper towels may come in handy)
    f. Thank your volunteer and have her/him sit down

3. Ask for another volunteer; ask her/his name
    a. Set aside the small bucket and scrambled egg
    b. Ask, What we could do to protect an egg and prevent it from cracking?
    c. We don't have a bike helmet for an egg, but we do have… the impact-resistant egg vehicle
    d. Discuss what would happen if we dropped an egg riding in the "vehicle"
    e. Ask if we should test that hypothesis
    f. Help the volunteer secure the remaining intact egg in the protective vehicle
    g. Have the volunteer drop the vehicle
    h. Examine the results, and discuss
        (If the vehicle fails to protect the egg, the paper towels may again come in handy. You can explain, the egg vehicle, like a bike helmet does not always protect; the best thing is not to have an accident.)
    i. Thank your volunteer and have her/him sit down

4. Ask for another volunteer; ask her/his name
    a. Have the volunteer put on the bike helmet and fasten the loose straps
    b. Do you think this will work if Johnny/Jenny crashes? Why? What do we need to do?
    c. Bring out the *Bike Helmet Fitting Guide*
    d. Fit the helmet properly on the volunteer
    e. Tell children you will give them a guide to take home, and info on where to get a helmet
    f. Thank your volunteer and have her/him sit down

Powerpoint Presentation

As you transition to the ppt presentation, ask if anyone has seen a picture of the human brain?

Slide 1: TITLE SLIDE

Slide 2: LOBES – the brain has different parts
What are the five senses? Point out general regions related to the senses
Discuss why the frontal lobe is so important: deciding what we do

Slide 3: PUZZLE - The brain has lots of smaller parts that fit together
If we made the smaller parts different colors, then the brain looks like a puzzle

Slide 4: HUMAN BRAIN (SIDE VIEW) – have you ever seen a picture of a real human brain
What does it look like to you?
Now, what part helps us to walk and balance?
And what part helps us decide what we do?
Where does the brain work on hearing? touch? taste? smell?
What did we leave out? (sight)

Slide 5: SCIENTISTS – This woman and this man are two REAL scientists who study the brain.
They study what alcohol and drugs do in the brain.
Have you heard of alcohol? What is it?
What are drugs? When are they good for you? When are they bad for you?

Slide 6: HUMAN BRAIN (TOP VIEW) – tell me, what's different about this picture
From the top, you see that the brain is divided into two halves, a right side and a left side
If we looked inside the brain right here across the middle, what would it look like?
Go on to next slide

Slide 7: HUMAN BRAIN SECTION – you can see the right half and the left half
Does it look like a ball? Yes/No? Kind of scrunched together?
Ask for a volunteer; ask her/his name
Bring out a full sheet of newspaper
The brain is kind of like a sheet of newspaper because it's folded in on itself
Hand the sheet of newspaper to your volunteer
If this sheet of newspaper was your brain, how would you get it to fit inside your head?
Volunteer scrunches newspaper into a ball
Right! Now you can show your family how the brain fits inside your head
Thank your volunteer and have her/him sit down

Slide 8: BRAIN FAIR at OMSI – Who likes fairs?
Who has been to OMSI? What do you do at OMSI? What do you see?

There's a special brain fair every Spring at OMSI for you and your families
Our scientists are back – they are helping kids make brain models to take home

Slide 9: Healthy Control v. Alcohol Dependent - Explain the two images
What do drugs do to the brain?
Does it work better? Not as well?
The brain of the person who didn't drink alcohol shows a lot more going on
Now, what part of you controls what you do and makes everything about you work?
So, if your brain is not working so well, what happens to the rest of you?

Slide 10: NERVES – If your hand touches a hot stove, how does it know to jerk away fast?
How do messages get from one part of our body to another?
The brain is the message center of the body
The brain gets messages from outside of the body
And, the brain is in charge of messages going from one part of the body to another
We have nerves. Nerves are like telephone lines that carry the messages

Make a brain
Ask five students to form a circle holding hands at the front of the classroom
Make two "telephone lines"
Ask the remaining students to make 2 lines holding hands along 2 sides of the room

"Connect" the two lines to the brain by holding hands
Two options:
1. Students squeeze hands in sequence to pass a "message" from one neuron to another, and on to brain
2. Pass a paper message along both lines to brain, and then from the brain
If the two lines were legs, they could simulate nerve messages involved in walking

"Break" one of the lines
Demonstrate that the message no longer goes through
Ask everyone to take their seats

Slide 11: LIGHTS ON / LIGHTS OFF –
What's going on with the brighter brains on top and the darker brains on the bottom?
Which brain would you want?

Slide12: GAMES – One last slide, one of our students came up with a new game: The Synapse
The game shows how nerves communicate with each other
Small packets of special chemicals go back and forth between the nerve cells

Any questions????

Announce that we have three activity stations set up for brain projects. Everyone takes turns at each station. Divide the class into three equal groups.

Activity Station #1: Comparing Brains

1. Compare the different brains
2. How are they similar?
3. How are they different?
4. What does having a larger brain mean? a smaller brain?

5. Another good reason to wear a bike helmet:
    a. Your brain floats in liquid; it can slam against the skull if you get hit in the head
    b. A bike helmet can reduce how hard the brain hits the skull
    c. You can show your family this
    d. Take a jar, put water in it, and put in a small apple or piece of an apple
    e. The apple floats, but it can still hit the side of the jar

Activity Station #2: Brain Models

1. Use modeling compound to make models of the brain that children can take home
2. Each child starts with a ball of compound slightly larger than a golf ball
3. Water-based markers can color the compound without transferring the color to hands or table
4. Apply the marker, and then knead the compound until the color is distributed as desired
5. Divide the compound
    a. make two equal size large balls
    b. make two equal size smaller balls
    c. the size ratio for the large size and smaller size can be about 4:1

6. Roll each of the two smaller balls into a "snake" about 1/8" in diameter
    a. Very gently roll each snake into a ball but DO NOT squeeze or compress
    b. Each ball looks a bit like a ball of twine; set both aside

7. Roll each of the two larger balls into larger "snakes" about 1/8"-1/4" in diameter
    a. Very gently roll each larger snake into an egg shape, but DO NOT squeeze or compress
    b. Gently form one egg shape into the right hemisphere and the other into the left
    b. Then gently attach them together

8. Gently form each of the small "twine" balls into the two halves of the cerebellum
    Connect to the larger hemispheres – Done!

9. Put the brain model in a small ziplock plastic bag when finished for the student to take home

Activity Station #3: Brain Hats

1. From a sheet of thin plastic foam cut out a 2" wide strip; use clear tape to form a hatband
2. Color one right and one left brain hemisphere; attached plastic stickers as desired
3. Identify major brain areas related to the five senses
4. Tape the hemispheres to the hatband, try out the hat – Done!

Concluding the Program

1. Wrap up with the children:
    a. What did you like best and least about the program?
    b. When you go home today, what will you tell your parents and families about the brain?
    c. Why is the brain important? what does it do?
    d. How can the brain get hurt?
    e. How do we take care of our brains.
    f. Who studies the brain? *(We do! And neuroscientists too!)*
    g. Who wants to be a scientist?
    h. Thank them for their invitation and for their participation

2. Give each child a "loot" bag to use to carry brain items and safety handouts home

3. Request feedback from the classroom teacher and other adult participants:
    a. What did you like best and least about the program?
    b. What worked best / least well?
    c. What would you change?
    d. Would any type of follow up help? If so, what would help?
    E. Thank them for their invitation and for their participation

Presentation Materials List:

Scientist Garb and Accessories:
- lab coat
- ID badge
- silly brain hat
- foam brain model
- tools/toys of the trade (stethoscope, otoscope, etc., if you are qualified to use them)

PowerPoint Presentation:
- laser pointer
- laptop, with ppt presentation loaded
- ppt projector
- power strip, extension cord

Bike Helmet Demo:
- bike helmet
- 2 eggs
- small bucket
- impact-resistant egg vehicle
- paper towels

Activity Station #1: Comparing Brains
- comparative anatomy brains/sections
- water-tight jar and lid filled half way with water
- small apple that fits into jar

Activity Station #2: Brain Models
- modeling compound
- markers
- small ziplock plastic bags

Activity Station #3: Brain Hats
- sheets of foam for hat bands
- photocopied outlines of the brain to color
- scissors
- clear tape

Safety Handouts (for parents/caregivers):
- safety tips from ThinkFirst Oregon
- bike helmet fitting guide

Loot Bags: for children to transport everything (brain model, brain hat, safety handouts, etc) home