

Summer Outreach, 2015: Jason Lee

Weekly Schedule...

Week One: BRAINS!

- Day One: Introductions
 - Learning Objectives: Learn class expectations; Get to know one another using kinesthetics and verbal memory; Make visual representation of selves via nametags; Learn what the students know, don't know, and what they want to know.
- Day Two: Neurons & Neurotransmitters
 - Learning Objectives: The basic structure of brain cells via aural means during lecture, visual means by utilizing a handout, and kinesthetic means by allowing the students to be artistic and create a network of neurons out of pipecleaners.
- Day Three: Lobes of the Brain & Major Structures
 - Learning Objectives: The major structures of the brain through visual, aural, and hands-on experiences.
- Day Four: Review of Brain Physiology
 - Learning Objectives: How different areas of the brain relate to various actions; To critically think about what would happen to the brain if damage were to occur.

Week Two: VARIOUS SYSTEMS & SENSATION/PERCEPTION

- Day One: Visual System (Part I)
 - Learning Objectives: The basic structure of the eye (rods, cones, and visual pathways); Understand the after-image effect and how it relates back to color theory.
- Day Two: Visual System (Part II) & Auditory System
 - Learning Objectives: How optical illusions trick our brains;
- Day Three: Somatosensation
 - Learning Objectives: The motor cortex, reflexes, and the human-human explanation.
- Day Four: Taste
 - Learning Objectives: The sensation of taste; Perception of taste, Evolution of taste.

Week Three: NEUROPLASTICITY, THE ADOLESCENT BRAIN, DRUGS, MEMORY, SLEEP, & SHEEPIE DISSECTIONS!

- Day One: Neuroplasticity, Drugs, & The Developing Adolescent Brain
 - Learning Objectives:
- Day Two: Memory & Sleep
 - Learning Objectives:
- Day Three: Sheepies Dissection
 - Learning Objectives:
- Day Four: Partay
 - Learning Objectives: Have fun with a party, game of jeopardy, food, display of artwork, and a little graduation ceremony!

Articles as Handouts:

- “Learning: It’s a memory thing”, from The Why Files
 - http://whyfiles.org/184make_memory/4.html
- “Are adolescents really risk-takers? Most adults say yes, but the science is starting to say no”, from Frontiers for Young Minds
 - <http://kids.frontiersin.org/article/10.3389/frym.2015.00003>
- “Your brain is like a muscle: Use it and make it strong”, from Frontiers for Young Minds
 - <http://kids.frontiersin.org/article/10.3389/frym.2014.00005>
- “Drama in the teenage brain”, from Frontiers for Young Minds
 - <http://kids.frontiersin.org/article/10.3389/frym.2014.00016>

Activity Ideas:

- Quick review of the lesson plan from the previous day
- Theater
 - Which can range from simple to complex
- Outside games
 - Relay/Tag
- “Guess what structure is affected”
 - Students act out what would happen if a certain area of the brain were removed while the rest of the students try to guess which area was affected
- Human brains
 - Look at them, feel them, hold them, discuss the different structures and functions
- Sheep brain dissection

- Miracle berry fruits
 - During the sensation and perception week
- Rubber arm
 - During the sensation and perception week
- Drunk goggles
 - To display the drug or alcohol effect
- Create pipe cleaner neurons
- Create brain collages

Daily Agendas:

WEEK ONE: Brains

❖ Day one: Getting to Know Each Other/ Overview of the weeks to come

- Cool “wow” factor (something on the overhead as they come in (video, brain game, etc.) that will grab their attention and get them excited about brains! ~As they enter (first few minutes)
- Introduce ourselves
 - Keep it short and sweet -- Name, background, and favorite food (or something)
 - (Sam) Quick review of SUN school expectations/rules (Sam had good idea on how to do this related to how he did it as a back packing leader for kids)
- (Wendy) Make name tags~15 min
 - Hand them out and decorate them. Materials needed: pre-printed (?) card stock with their names (have blank extras), way to attach them (yarn/tape/IDK), markers, stickers with brain related pics (?), misc. art supplies (glue/glitter,etc.)
- (Rebecca) Play an ice breaker game using Shawn’s brain ball. ~20 min?
 - Pass brain-ball between us and kids, and each time you catch ball you repeat: name of person who passed you the ball, then: “My name is _____ and I (like/hate/collect,etc._____)”
- (Elizabeth/Lead/co-lead (Rebecca)) Bring them back and ask: (At least one person on the whiteboard to record brainstorm while one person leads discussion) ~45 min
 - Who has done this program before? What do you remember?
 - Brain myths? Let’s debunk them!
 - What does everybody want to learn about?
 - This is what we’ll be doing over the next three weeks!

- (Lead) Big brain and the front of the class (printed by Wendy (needs good res. image still!))
 - Explain what this is doing up on the wall, and how we will add to it as the weeks go by
 - We will “peg” stuff we have learned to it at the end of each day (where does what we learn correspond in the brain)
Materials needed: (IDK, post it notes? cut outs/collage materials?)
 - Explain that they may not know where things (on the big brain) are yet, but we will help them, and by the end of the three weeks, they won’t need our help at all!

❖ Day two: Neurons/Neurotransmitters

- Some new attention grabber on board/overhead as they come in
- (Wendy) Opening, overview of day
 - Making journal folder for handouts (decorate) to be kept in the room to collect all handouts given throughout the weeks ~20 min
- (Elizabeth/Ivy (to help with visuals)) Neurons (mini-lecture with visuals/handout) ~20 min
 - Cell structure
 - Neurotransmitter/cell to cell communication, etc. (?)
 - Maybe show this 5 minute video- new technique for visualizing cells - mapping brain connections at cell level

<http://ngm.nationalgeographic.com/2014/02/brain/voyage-video>

- (Ivy/Elizabeth) Pipe cleaner neuron- Each kid makes their own neuron, then they work a team to build a neural network- see detailed lesson plan below- 45- 60 minutes
- (Andrea/Lead/Adrienne co-lead) Outside Game: “Synaptic Tag”: designate one area as pre-synapse and another area some distance away as post-synapse, kids are neurotransmitters and enzymes (good explanation of the game given on the Washington Faculty resource page (I think Adrienne has a copy printed already)
- (Rebecca) Closing for the day: What did we learn? Individuals “peg” stuff to our big brain today!!)

❖ Day three: Lobes and Major Structures of the Brain

- New attention grabber on overhead as they come in
- (Adrienne Lead) Opening, review the day (We have the human brain today!!)

- (Elizabeth/Lead/Adrienne co-Lead (help with visuals, etc.)) The four lobes of the brain -- as well as cerebellum and limbic system (?) I think at least these are important (vocab like sulci, gyri, fissure, etc.). Since they will be seeing and touching a real brain that day, I think it is important we talk about the sulci/gyri
 - Lead with a lecture/discussion format (corresponding handout/visual aid) ~30 min
- (Andrea/Ivy) Outside Game: (action potential tag maybe?) While half of us are leading outside game, the other half will set up the human brain inside. ~20 min
- (Lead/Elizabeth) Bring on the brains!! ~rest of class
 - Present as a whole class, then maybe break into rotating groups for touching (depending on class size)
 - (Lead (Ivy maybe?) have art activity planned for those not wanting to get too hands on with the brain, or are on deck to get to hold/touch brain- Maybe I stay outside with the kids who don't want to hold the brain- Ivy
- (Andrea) Closing for day: How did what we learn relate to our big brain? "Peg" stuff to big brain.

❖ **Day four: Review of Brain Physiology**

- New attention getter on overhead as they come in
- (Adrienne) Opening, quick review of week- 5- 10 minutes
- (Wendy/co-Lead (Andrea)) Questions/What did you like?/What did you think about the human brain yesterday?~10-15 min
- (Andrea/Ivy) Discussion of color theory/color wheel; build the brain helmets as a review of basic brain structures (See detailed lesson plan below) - 45- 60 minutes
- (ShawnLead) Explain what damage to different areas of the brain might do (using zombie examples to reference next outdoor activity)
- If there's time: Outdoor game: Zombie tag! (similar to infection tag) *see outline on NWNoggin page under resources, relate damage to zombie brain in different lobes to how it would make zombie act)
- (Lead) Closing: How did what we learn relate to our big brain? "Peg" stuff. Quick foreshadow what we are doing next week!

WEEK TWO: Various systems & Sensation/Perception

❖ **Day one- vision**

- New attention grabber on overhead!

- (Adrienne) Opening, welcome back, quick overview of the week to come, and what's happening today ~10min
- (Lead/Brian/Elizabeth) give short lesson about vision including structure of eye, rods and cones, and visual pathways include visuals/diagrams (on powerpoint? or handout, or both?) Blind spot handout, other optical illusions? ~15 min
- (Lead (Brian maybe)/Lead) Talk about color blindness/give color blindness test on the overhead. ~10-15 min
- (Ivy) After-image painting project- talk about the after-image effect, relating it back to color theory discussion, have kids create an after-image painting; groups then test the pictures to see if they work

❖ Day two- visual (part 2) and auditory

- review vision- continue lecture part 2?
- Stations
- (Lead/Lead) Play monocular depth cues game? (outside or in gym) kids break into pairs/groups, play "Bozo" type bucket game with one eye covered, then with both eyes open. Make hypothesis about skill level for both trials (Adrienne has nice example of this game from the Washington faculty resource. Materials needed: buckets/pails, ping-pong or tennis balls (enough for at least one per group) ~30 min
- (Lead) Come back together, we will have stations set up with an activity at each ~rest of class time ~10 to 15 (IDK) min at each station
 - leader will give a handout that kids can fill in as they go through each station
 - leader will explain how they go through each station, what they are expected to do at each, etc., and what signal we will give when it's time to switch.

Stations:

- (Lead) Drunk goggles (what happens to your vision?)
- (Andrea) Why is the sky blue, and other color related fun stuff
- (Elizabeth?) optical illusions, why does our brain trick us?! (Maybe we can make something at this station for them to take home and amaze their friends, like the bird in the cage, etc. (?))
- auditory lecture (LEAD)
- auditory activities
 - McGurk effect, high pitch, etc

Possible articles for journal: "What parts of our brain do we use to name that tune?" Link: <http://kids.frontiersin.org/article/10.3389/frym.2015.00006>

- dance

❖ **Day three- somatosensation**

- (LEAD) short lecture (basic motor cortex, motor reflexes, rubber arm and human-human) Day two- visual (part 2) and auditory
 - review vision- continue lecture part 2?
 - Stations
- (Lead/Lead) Play monocular depth cues game? (outside or in gym) kids break into pairs/groups, play “Bozo” type bucket game with one eye covered, then with both eyes open. Make hypothesis about skill level for both trials (Adrienne has nice example of this game from the Washington faculty resource. Materials needed: buckets/pails, ping-pong or tennis balls (enough for at least one per group) ~30 min
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 - dance explanation)
- rubber arm, human-human interface
- Possible articles for journal: “Hitting a baseball needs the brain” Link: <http://kids.frontiersin.org/article/10.3389/frym.2014.00020>
“So you think you can’t dance?: The case of the man with two left feet”
Link: <http://kids.frontiersin.org/article/10.3389/frym.2014.00011>

❖ Day four-taste

- (Lead) Review from previous day
- (Adrienne/Lead/co-Lead) Explain/teach about the sensation of taste: Here are some topic ideas that we could cover for this lesson (obviously we don't have to say all of this, but here are some ways we might want to approach teaching about taste and maybe questions to pose for class discussions):
 - Why are some foods (like chocolate chip cookies) delicious while others (like cookies made with meal rrom) disgusting? (MAYBE HAVE A CLASS DISCUSSION ABOUT WHY THEY MAY THINK THAT IS SO) One might think they understand what makes something sweet, salty or bitter, but flavor makers out there that provide food in our grocery stores know the real truth: Not only is our perception of flavor far more complex than we imagine, which involves all our senses and even our memories, and once you master the secrets of flavor, it is easy to fool the taste buds.
 - Another question to pose to the class as a discussion is why they think different things taste better to different people. Why do some people seek out spicy and tangy food at a restaurant and others go for the bland and familiar? When we sit down to devour our favorite meal, we take for granted that we will be able to taste and savor the different flavors in the food. Our sense of taste is so critical to our daily lives that we seldom think about it. But taste, as scientists are discovering, is anything but ordinary! It is a highly complex neurobiological process influenced by many factors, including genes, age and experience.
 - Scientists believe taste evolved to protect us from eating things that are poisonous and to ensure we get the calories and nutrients we need. Many poisons are either bitter or sour — tastes we tend to reject. Enjoyment of salty and sweet-tasting foods, on the other hand, ensures we meet our nutritional requirements for salts (especially sodium chloride) and carbohydrates (including sugars). A fifth taste, umami (Japanese for “savory”), encourages us to eat foods rich in glutamate, an amino acid found in meats, cheeses, and tomatoes. Some scientists believe humans have a sixth basic taste — for fat.
 - Taste begins in the mouth, where each of us has between 5,000 and 10,000 taste buds. Most taste buds are located within the

tongue's small, visible bumps — or papillae — but some can be found in other areas of the mouth and throat. Each taste bud contains 50 to 100 taste receptor cells — brain cells called neurons that transmit taste information. When we eat a strawberry, for example, saliva dissolves the fruit's chemicals, which then enter into the central pores of the taste buds and bind to the taste cells. The cells quickly send “sweet” and “sour” taste messages from these chemicals through nerve fibers to the brain, where they eventually reach the sensory cortex. However, the flavor of “strawberry” requires the addition of information gained through smell. What links the seemingly disparate senses of taste and smell so closely is that both are, at their most basic level, triggered by the same environment cues. Both smell receptors and taste receptors are attenuated to detect certain chemicals, and then relay information about the chemical environment to the brain.

- (Lead) Break
- (Adrienne) Tasty Buds activity? (see word document I sent through email)
This might be good to do before the miracle berries as it has them experimenting which parts of their tongue are more sensitive to certain flavors and they can draw their tongue and illustrate what areas of the tongue were more sensitive to certain flavors and we can compare drawings.
- (Lead) Tasty Visions activity? (see word document I sent through email).
We probably won't have enough time for all of this, but maybe a good activity to have in our back pocket?
- (Lead) miracle berries
- spicy foods (shawn)
- Write in journal/peg stuff on big brain for last 10 minutes about what they learned from today, what was fun for them, any remaining questions they might be pondering, and/or any key vocabulary words learned from that day

WEEK THREE: Drugs, The adolescent brain, Memory, Sleep, Neuroplasticity (Dissect some sheepies)

❖ **Day one: Neuroplasticity/the adolescent brain**

- Possible articles for journal: “Building roads in the city of your brain”
Link: <http://kids.frontiersin.org/article/10.3389/frym.2014.00017>

❖ **Day two: Memory/Sleep (shawn)**

- Start class by playing songs that they said they liked from the first day of class and see if they know the song.
 - Lead into what is memory (short-term vs. long-term) How are memories formed and made
- Possible articles for journal: “Dad can time travel, but Grandpa can’t”
Link: <http://kids.frontiersin.org/article/10.3389/frym.2014.00018>

❖ Day three

- SHEEPIES
 - other stations? art project? mind flex? rubber arm or mirror drawing stations?

❖ Day four

- Party/display artwork/Jeopardy/closing ceremony(?) Food! I can make ice cream and sorbet if there’s a freezer - Ivy

Specific Activity Ideas:

➤ “Abstract Pictionary”

- Try to relate ideas of perception metaphorically using lines/colors to convey certain ideas
- i.e., tell groups/individuals particular concept to try to convey (depending on what we’re talking about, hot, spicy, cold, angry, etc) using colors/lines - nothing concrete; have other individuals/group try to guess

➤ “Pipe cleaner Neurons/Neural network” (Week One: Day 2)

○ Learning Objectives:

- Know the basic structure of a neuron and how it joins with other neurons to form a neural network

3-dimensional design, and modular design

to interpret a scientific idea

with other artists

○ Materials:

who were inspired by the brain

■ Pipe cleaners

■ Beads

○ Lesson Plan:

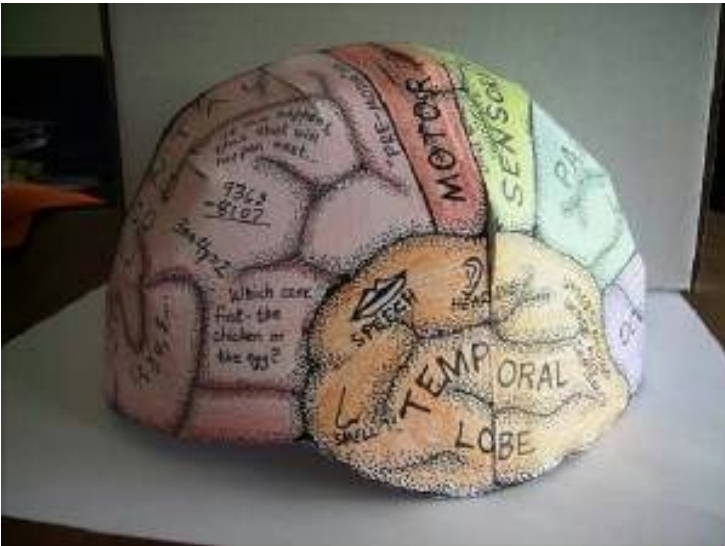


- We'll begin with a discussion of using art to interpret and communicate scientific concepts; I'll have examples of specific artists who use the brain as an inspiration for their work. Then I'll talk briefly about modular design and collaborative design, with some further artist examples. Each student will use pipe cleaners to create a neuron, including axons and dendrites, keeping in mind that their neuron will need to be joined with the others to form a network. We'll help the kids as needed so they include all the parts of the neuron structure, then we'll work as a group to put the network together, brainstorming solutions for connecting the neurons. Teachers should be facilitators, and let the kids be creative in interpreting what a neuron looks like. Working as a team will also reinforce their understanding of networks.

➤ **“Making Brain Hats”** (Week One: Day 4)

○ Learning Objectives:

- Know the lobes and major functions.
- Know the basics of color theory (the color wheel; primary, secondary, and complementary colors; cultural perceptions of colors [i.e, black is for mourning, etc.]; what feelings or ideas do each of us associate with which colors?)
- Use colors to represent different areas of the brain. Show that every brain's “personality” is different and unique even though the basic structure is the same.



○ Materials:

- Card stock with printed templates (we'll cut these out ahead of time)
- Markers/Paint/Collage materials
- Scissors
- Elmer's glue
- Clothespins/clips to clamp template pieces together while glue dries

○ Lesson Plan:

- Pass out templates. Have each table group stocked with materials and one of us to help. Hold back the paint, glue, and collage materials until we're done with the labeling and information. Have

primary teacher introduce the major lobes of the brain. Include at least Frontal, Temporal, Occipital, Parietal Lobes; maybe include somatosensory/motor cortex. Use a big visual on projector/overhead (or our “big brain“ poster) to show where locations are, as well as have one of us showing where this is on the template. As each lobe is discussed, outline the major functions of that area. The kids will label each area as we talk about them.

- Once labeling is done, we'll talk about color theory, then the kids can color/paint/collage their brains, trying to keep the designated areas different (colors/patterns, etc). Encourage them to use color to represent their own special individual brain. Glue the template sections together and clamp to dry. This part will take help from all the adults, as it requires making the dome shape- we can do this step by step as a class.
- Kids can wear their brains whenever they want to; we'll keep them in the classroom along with their journals. The kids can add more color, texture, and pattern to their brain hats, and we can also use them for other activities such as brain damage activity, or zombie activity, learning about the adolescent brain, whatever!
- Link: <https://steameducation.wordpress.com/2012/03/21/brain-hat-activity/>

Further Websites to Assist in the Creation of Curriculum:

- <http://mnf.jhu.edu/teachers.html>
- http://thebrain.mcgill.ca/flash/a/a_12/a_12_p/a_12_p_con/a_12_p_con.html
- http://www.brainboxx.co.uk/a3_aspects/pages/memorygames.htm
- http://kids.lovetoknow.com/wiki/Neuroscience_for_Kids
- <http://faculty.washington.edu/chudler/chgames.html>
- http://thebrain.mcgill.ca/flash/a/a_09/a_09_cr/a_09_cr_dev/a_09_cr_dev.html
- <http://serendip.brynmawr.edu/bb/kinser/Compare2.html>
- <https://www.youtube.com/playlist?list=PL8dPuuaLjXtOPRKzVLY0jJY-uHOH9KVU6>
- Brain matching game:
 - <http://www.anatomyarcade.com/games/matchingGames/MatchABrain/mat chABrain.htm>