NQ 1-DAY CURRICULUM

Resources include:

- brain encyclopedia
- teacher's notes
- questions
- quizzes
- videos
- more

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One Day Neuroscience Workshop Curriculum for Middle & High School Students

Approximate Duration: 90 minutes

Introduction to Neuroscience (10 minutes)

- Introduction to Neuroscience Video (3 minutes)
- Interactive Q&A and Discussion (7 minutes)
    - Pose questions to think about to spark students' interests
        - Refer to the 20 Questions to Ponder doc for examples
    - Encourage students to share their thoughts and clear up common misconceptions. **Note that most questions on the provided document don't have a single right answer and emphasize the point that research is still ongoing to deduce the answers to these questions.**

Brain Anatomy and Functions (25 minutes)

- Interactive 3D Brain Model Exploration (10 minutes)
    - Allow students to use a 3D brain atlas tool such as the one offered by Neurotorium or the one offered by Brain Facts to explore different brain parts.
    - Discuss the functions of major areas including the cerebrum, cerebellum, and brainstem using our Brain Encyclopedia
- Build-a-Neuron Activity (15 minutes)
    - Provide materials (pipe cleaners, beads, string) for students to construct a simple neuron model, emphasizing parts like the axon, dendrites, and cell body.
    - Explain how neurons communicate through electrical and chemical signals.

The Senses and the Brain (20 minutes)

- Discussion and Demonstration (5 minutes)
    - Discuss how the brain processes sensory information (sight, hearing, touch, taste, smell).
    - Quick experiments:
        - *Blindfolded Sound Localization: Use a sound source (e.g., a bell) and have students point to the source while blindfolded.*
        - *Taste without Smell: Have students taste flavored jelly beans while holding their noses and then release to note the difference.*

- Q&A and Insights (10 minutes)
    - Discuss the reasoning behind the experiments.
        - *Blindfolded Sound Localization: The Blindfolded Sound Localization experiment demonstrates how the brain processes auditory information to determine the location of a sound source without visual cues. In this activity, students are blindfolded to eliminate visual input, relying solely on their auditory system. Using a sound source like a bell, they attempt to identify the direction of the sound. This experiment highlights key concepts in neuroscience, including the roles of the outer, middle, and inner ear in capturing and transmitting sound waves. The brain uses binaural hearing, relying on interaural time difference (ITD) and interaural level difference (ILD) to pinpoint the direction of sounds horizontally, while spectral cues help with vertical localization. The primary auditory cortex processes these signals, while brainstem structures aid in sound localization.*
        - *Taste without Smell: The Taste Without Smell experiment demonstrates how the senses of taste and smell combine to create the perception of flavor. By having students taste flavored jelly beans while holding their noses and then releasing their noses to taste again, they can observe the significant impact of smell on taste perception. The gustatory system detects five basic tastes—sweet, sour, salty, bitter, and umami—through taste receptors on the tongue, while the olfactory system detects odor molecules that travel to the nose. The brain integrates these signals from the gustatory and olfactory systems to form the perception of flavor. Holding the nose prevents odor molecules from reaching the olfactory receptors, thereby reducing the ability to perceive the full flavor of the food.*

- Explain the connection between senses and brain processing.
    - Video Clip on Sensory Perception (5 minutes)

Brain Health: Nutrition, Exercise, and Sleep (15 mins)

- Interactive Discussion and Presentation (5 minutes)
    - Show students the video on brain health focusing on nutrition, sleep, and exercise
    - Emphasize the importance of a balanced diet, regular exercise, and adequate sleep for a healthy brain.
        - *A balanced diet, regular exercise, and adequate sleep are crucial for maintaining a healthy brain, as they support cognitive function, emotional regulation, and overall mental well-being. Nutrient-rich foods provide essential vitamins and minerals that promote neurotransmitter function and brain plasticity, which are vital for learning and memory. Regular exercise increases blood flow to the brain, stimulating the production of neurotrophic factors that enhance neuron growth and connectivity. Adequate sleep is essential for memory consolidation and the removal of neurotoxins that accumulate during wakefulness. Together, these healthy habits ensure optimal brain function, improve mood, and enhance the ability to focus and perform well academically.*

- "Brain-Healthy Lifestyle Plan" Activity (10 minutes)
    - Students create schedules and meal plans that promote brain health and take turns explaining the neuroscience behind how they crafted their plans (e.g., eating certain foods, engaging in physical activity, setting a sleep schedule). Discuss how these activities could positively impact their learning and daily life.

Wrap-Up and Reflection (15 minutes)

- Key Points Recap with Quiz (10 minutes)
- Use the provided quiz (or Kahoot) to recap the day's lessons. This reinforces learning and adds a fun competitive element.
- Feedback and Future Interests (5 minutes)
- Ask students to fill out the feedback form.