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Inside the Brain's Recognition System: How We Know We Know Someone

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Inside the Brain's Recognition System: How We Know We Know Someone

This Level 4 observation-ready lesson engages students in inquiry-based neuroscience learning through hands-on experimentation, collaborative modeling, and metacognitive reflection. Students investigate how stimulus information travels from the eyes to the visual cortex and memory systems, explaining why familiar faces are recognized faster than unfamiliar ones and context is important when retrieving social memories. Students will demonstrate mastery by accurately diagramming neural pathways, interpreting experimental data, and explaining social recognition scientifically.

Suggested duration

- 45-60 min class period

Essential questions

- How is vision processed by the eye and brain?
- What role does memory and context play in social recognition?
- How does the brain recognize familiar faces?

Objectives

Student-friendly learning targets:

- I can trace how information moves through the brain.
- I can model neuron communication.
- I can analyze how context affects memory retrieval
- I can explain why familiar faces are recognized faster.

Measurable Objectives:

- Students will model neural pathways with 90% diagram accuracy.
- Students will analyze reaction-time data and explain results using neuroscience vocabulary.

- Students will construct written explanations demonstrating cause-and-effect relationships in brain processing.

Materials

- Slide Deck
- Smartboard or projector
- Exit Ticket
- Class Worksheet

Based on

The Stavros Niarchos Brain Insight Lecture

- “How We Perceive Ourselves and Others”
By Steven A. Siegelbaum, Ph. D. and Jon B. Freeman, Ph.D.



Instructional Activities

Instructional sequence summary (Danielson Domain 3)

- Do Now: Students reflect on recognizing someone outside expected context.
- Mini Lesson: Teacher models neural pathway using visual diagram.
- Activity 1: Reaction Time Investigation comparing familiar vs. unfamiliar faces.
- Activity 2: Neuron Relay Simulation modeling synaptic transmission.
- Activity 3: Context Scenarios ("Butcher on the Bus/ Barista on the Subway").

1. Do Now, Turn and Talk, Warm Up Discussion | ⌚ 10min

As students enter the class, greet them by name, ask them to take a seat, and encourage them to begin answering the prompt on the board. Meanwhile, ensure materials are ready.

- Prompt: Have you ever seen someone in an unexpected place and thought, "I know that person, but I don't know from where"? Write about that experience.
- Support prompt: If you need help, imagine seeing your principle at the beach.
- Advanced prompt: Describe your thoughts and emotions during the moment of confusion.
- Equity Move: Circulate to make sure all students are engaged.

After a few 5 minutes of independent worktime, ask students to turn and talk to a partner. Each partner will share for 30 seconds.

- Talk move: Encourage students to listen for similarities between experiences.

- Ask students to raise their hand if they felt confusion before remembering and to describe that experience. Record responses on the board.
- Preview that today's class will uncover what your brain is doing in that exact moment.

2. Neural Processing Lesson | ⌚ 8min

Explain the vision pathway step-by-step while pointing to a the diagram on the slide: when light reflects off of someone's face, it enters the eye. At the back of the eye, the retina converts light to neural signals. Those neural signals travel to the brain via the optic nerve. The visual cortex then processes the image so you can "see" it.

Invite students to turn and explain the pathway to a partner in their own words, to check their understanding.

Next, explain that recognition happens because of neural pathways shaped by experience.

Correct the misconception: Recognition does not occur in the eyes, it occurs in the brain.

3. Reaction Time Investigation | ⌚ 12 min

Tell students they will now test whether familiar faces are recognized faster than unfamiliar ones. Encourage students to work silently so everyone can concentrate.

Instructions: Press timer the moment recognition occurs and record your reaction times on the worksheet.

During the activity, circulate and ask students which faces triggered immediate recognition? What might explain the differences in speed?

After the activity, prompt students to graph the data and observe if any patterns emerge.



4. Neuron Relay Simulation | ⌚ 8 min

Prompt students to stand up and explain that they are all parts of the brain and visual system now.

Assign the following roles: retina, optic nerve, visual cortex, hippocampus, recognition response.

Instructions: When you receive a stimulus, pass the signal as quickly as possible.

Repeat again with familiar vs. unfamiliar stimuli.

After the activity, debrief the following questions:

- Why did the familiar pathway move faster?
- What does this represent biologically?

4. Context Mismatch Scenarios | ⌚ 5 min

Prompt students imagine seeing their barista on the subway or their coach at the mall. Invite students to briefly discuss why recognition might be delayed.

Explain that the brain sees the face first, then searches for context about how you know them. That search creates the delay.

5. Reflection and Exit Ticket | ⌚ 5 min

Instruct students to complete the prompt on the exit ticket.

- Exit ticket prompt: When I instantly recognize someone, my brain is...

Collect exit tickets. Close by reinforcing that today's lesson demonstrated that recognition depends on neural pathways strengthened by context and experience.

Contingency Plans

- If class time is running ahead, facilitate a deeper discussion on emotional recognition.
- If classtime is running behind, prioritize closure reflection and key takeaway summary.
- Extension: students design recognition experiments using real-world participants.

Teacher Reflection (Domain 4)

- Which activity produced the strongest conceptual understanding?
- Did students transfer learning to real-world situations?
- How will instruction be adjusted next time?

Differentiation and Equity Practices

- Support Learners:
 - Visual diagrams and guided notes
 - Sentence starters and peer collaboration
- Multimodal Learners:
 - Kinesthetic neuron simulation
 - Visual modeling and discussion
- Advanced Learners:
 - Design independent neuroscience investigations
 - Compare human recognition to artificial intelligence systems



Standards

<p><u>NYS NEXT GENERATION SCIENCE STANDARDS</u></p>	<ul style="list-style-type: none">• <u>HS - LS1 - 2: Develop and use models illustrating interacting biological systems</u>• <u>HS - LS1 - 3: Plan and conduct investigations to explain biological processes</u>
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