**Lesson Plan:**

**Making the Right Connection: Building your brain!**

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| \***Theme**: | Axon growth and guidance |
| \***Objective**(s):  *(What key learning do you want students to come away with?)* | Teach students that molecules can signal to the axon to either turn around, stay put, or go forward! |

**LESSON OUTLINE:**

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| **1. Introduction:**  *Plan a script of what you will say to start.*  *- What will this be about? Why’s it interesting?*  *(Hook)* | What is your brain made of? (Neurons)  What do neurons do?  How do neurons communicate?   * Neurons talk in electric language, but messages need to travel to a lot of different areas * Axons grow from one area to another to facilitate/help neurons talk * But how do Axons know where to go? |

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| **2. Building Background:**  *List questions you can use to immediately engage your audience and prepare their thinking for your activity.*  *-What prior knowledge might they have about/related to your topic?*  *-What prior knowledge (background) do they need for your activity?* | Q: How do neurons communicate?  A: Electric and chemical language, transmitted across long distances along highways—Axons!!   * Neurons talk in electric language, but messages need to travel to a lot of different areas * Axons grow from one area to another to facilitate/help neurons talk * But how do Axons know where to go?   Q: These axons need to connect to the right place…How???  Q: What do you leave from one place and go to another?  A: You can think about being attracted to a certain area. Flies are attracted to honey, we are attracted to smells of food, our bodies are attracted to stay on the earth by gravity! There are FORCES in the world that draw things together. And just like that, Axons are drawn to certain places by attractive things—in their case a class of molecules called Ephrins. |

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| **3. Lesson & Activity:**  *Outline the key components of your lesson.*  **Plan/Note**:  - key ideas/ vocabulary  - scaffolds  - images/media  - extension questions  \*Consider how to best deliver your content!  \*Plan interactive components that encourage active thinking in your students. | Q: How do axons move?  A: Axons are attracted to areas where there is less of a specific molecule. Think about it like a stinky smell—if there is something that smells like garbage, you’re going to want to run away from it. But, as you get further and further away, you will start walking slower, and if you run into a bed of flowers, you will want to stay and smell them!   * Axons have proteins on them that can sense the “smell” around them, and the smell comes from another protein. The sensors are called EphA receptors, and the smell are ephrin-A molecules. * Cells in the retinal (retinal ganglion cells) have different numbers of sensors (receptors), and they keep track of what area has more ephrin-A (aversive), and what areas have less ephrin-A. * If there is a lot of ephrin-A, the axons are repelled from that area, and travel away from that spot. * Use the density tower, where each level represents different concentrations of ephrin-A, and the items that settle in each level. Each item represents a retinal ganglion cell axon, which has different amounts of receptors on it. |

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| **4. Wrap Up:**  *- Review key ideas*  *- Share takeaways and final thoughts*  *- Discuss connections to other questions and ideas. Extensions.*  *- Ask: Who could you teach what you learned here today?*  *- Ask/Suggest: What can I do to learn more?* | * The retina isn’t the only part of the brain that works like this! Many areas of the brain use guidance cues from other molecules! * Ephrin-A and EphAs are not the only pair that interact this way! Many many more pairs! * This is not representative of the entire growth and guidance process—but just a snapshot! |

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| **MATERIALS NEEDED: *\*\*(please list all items and quantities necessary for preparation)*** |
| * Poster Board * 2 Density towers and various items to drop in. * Towels for clean up if there are any spills |

\*\*attach any printouts to end of document here

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| **Other Notes** |
| * This is a pretty difficult activity with a lot of moving parts. Make sure to rehearse and read through this lesson plan before starting the activity! |