Biology
Senses

Key Ideas/Takeaways:
1. What senses are used for
2. Depth perception associated with sight
3. Reaction time
4. Five different tastes

Duration of Lesson: 60 minutes although it can be altered depending on what experiments you would like to do

Supplies:
Sight Experiment
- Dixie cups (enough for students to work in pairs)
- Pennies (same amount as Dixie cups)

Taste Experiment
- Jelly beans or other sweet candy
- Sour patch kids
- Unsweetened chocolate
- Pretzels
- Peeled apples cut up into cubes
- Peeled potatoes cut into cubes

Reaction Time Experiment
- Yardstick
- Stopwatch

Introduction to Sight: (10 minutes)
To begin, have students list the five senses up on the board – sight, touch, smell, hearing, and taste. Ask the students why senses are important. Senses give our brain information about our environment. Sight lets us perceive, or see colors and depth perception (distance). The other senses also provide important information about our surroundings. Draw an outline of a person up on the board and draw a brain connected to the different areas of the body associated with each sense. So, the brain is connected by a nerve, represented by a line, to the eyes for sight, to the hands for touch, so the mouth for taste, etc. Ask the students why we are able to perceive these different senses if they are all the way out in our hands or our toes. Students should know that we need our brain to process or understand this information, but how does the information get to the brain from these different areas? The answer is nerves. Nerves connect all the different parts of the human body to the brain to transport information to and from it. Nerves are responsible for telling our brain what we sense, and nerves are also responsible for transmitting what action we want to do, to that body part. It’s a similar idea to a puppet on a string. Your brain in your hand telling the puppet what to do, and the string is the nerve that transmits that command to the body part.
The first sense students will be testing is sight. Have the students discuss in small groups whether two eyes are necessary for depth perception. Then, come back together and take a vote for those who think two eyes are necessary and those who think two eyes are not.

**Sight Experiment**: (10 minutes)

Before starting the experiment, demo it at the front of the class. Place a Dixie cup on a counter or table surface, then back away from the cup holding a penny. Then, with one eye open, approach the cup and try to drop the penny into the cup, making sure to not closer than 18 inches or so from the cup. Then, repeat with both eyes open. It should be much easier to drop the penny in the cup with both eyes open.

Have the students break off into pairs to try this experiment. Have one student holding the penny with both eyes open and another with one eye open. Have the student with the one eye open direct the student holding the penny how to move and when to drop the penny when they think it is above the cup. Again, make sure that the students don’t get too close to the cup and are at least 18 inches above it before dropping the penny. Let the students take turns trying each role, repeating with both eyes open for the person directing.

Next, have students grab two pencils, holding one in each hand with the erasers facing each other. Then, having students put their hands by their sides, close one eye, then lift their hands and try to touch the two eraser ends together. Students should then try doing so with both eyes open for comparison.

**Sight Experiment Conclusion**: (5 minutes)

Bring the class back together after collecting the materials. Have students discuss what worked better for them for each experiment – using one eye or two. Then, have them retake the vote. Have students answer why they think two eyes are needed for depth perception. Depth perception requires two eyes because each eye gives a slightly different view of an object, so when these views are combined, they help people perceive three dimensional space which is necessary not only to see how high something is or how far to the left or right it is, but also how far out in front of us it is.

**Introduction to Reaction Time**: (5 minutes)

Ask the students to define what reaction time is. They should know that reaction time is how long it takes for a person’s body to perceive something happening, send that information to the brain, and then have the brain send a command back to the body for an action to occur in response. Simply put, reaction time is the time between seeing something happening and responding to it. Now, have the students make a hypothesis about whether reaction time is the same all over their body. That is, does a foot react as quickly as a hand? Does a hand react as quickly as an eye? This can also be done by a vote.

**Reaction Time Experiment**: (15-20 minutes)

*Reaction Times Throughout the Body*

Have students stand up in a circle. Then, have students place their right hand on the person’s shoulder next to them. Tell students that once they feel the person to their left squeeze their shoulder, then they squeeze the next person’s shoulder. So, as a class, you will be seeing how fast you can get the squeeze to be sent around the circle. With a stopwatch in hand, squeeze a student’s shoulder and start the timer. When the squeeze comes back to the end, stop the stop-watch and record the time on the board. Have students try it one or two more times.
Then, have students stay in the circle, but kneel down and hold the person’s ankle. Do the same process.

*Reaction Times Between Students*

Holding a yardstick at the front of the class, have students form a single-file line. Have the person at the front of the line step forward and stick out their dominant hand, making a hand gesture like they are going to grab something, but the fingers are still open. Then, lift the yardstick above his or her hand and drop the yardstick through their grasp. Have the student try to grab the yard stick as soon as they can. Then, measure how far of a distance it took them and write it up on the board. Yardsticks are handy because the distance is whatever number on the stick they stopped at. Then, compare as a class the different distances. Those with faster reaction times have smaller distances because they were able to grab the yardstick faster. Each person has different reaction times, but it is something that people can work on improving.

*Reaction Time Conclusion: (5 minutes)*

Students should be able to see that when squeezing a person’s ankle, it takes a lot longer to go around the circle than it does with the shoulder. Ask students why they think that is. If they need help, remind them that nerves have to send the information about the squeeze to the brain, the brain then processes the information, and sends a command back to the hand to squeeze the next person. So, going from a shoulder to the brain is a shorter distance than going from the ankle to the brain. As a result, it takes longer for the information to travel.

*Introduction to Taste: (5 minutes)*

Have the students list the five tastes up on the board. Four of them should be easy: sweet, sour, bitter, and salty. The fifth one, umami, is difficult for students to remember. Another way to describe umami is savory. Ask the students what in their mouth is responsible for the sense of taste. Students should know that taste buds, the small red bumps on their tongues, are responsible. To taste something, saliva partially digests, or breaks down food, and takes it into the taste bud. There, the food makes the taste bug send a signal to the brain and the brain tells you what taste it is.

Another important sense closely related to taste is smell, also known as olfaction. Ask the students what happens when they get a really bad cold and their nose is all stuffed up. They can’t smell anything, can they taste things as well?

*Taste Experiment: (15 minutes)*

*Olfaction and Taste*

Pass around a couple bowls of potato cubes while the students have their noses plugged and do not tell them that it is potato. If they don’t, they will recognize what it is and not want to eat it. Then, have each student eat the potato while still plugging their noses. Some may taste a little but it should not be bad. Then, pass around apple cubes and do the same. Come back together and have the students discuss what they thought the two cubes were, whether they could taste them very well, or not. There should not be much of a difference between the two, although some students will recognize them a little bit.

*Four Flavors*

Pass out Dixie cups or bowls containing the jelly beans, sour patch kids, unsweetened chocolate, and pretzels. Have students eat one at a time and discuss what taste it is. Most of them will know what three of the tastes will be but the chocolate one should be a surprise and may be more difficult to explain.
Taste Experiment Conclusion: (5 minutes)

Come back together as a class to identify the flavor that each food represented. Then, recap about why senses are important. Ask the students what their favorite experiment of the day was.