

Lesson Plan Guidebook

made by students at Worcester Polytechnic
Institute in May 2019 for use by educators
at Physically Active Youth



WPI



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Opening Remarks

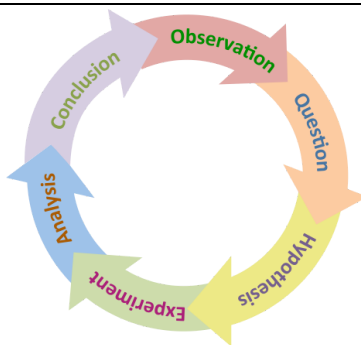
This guidebook represents the work that Worcester Polytechnic Institute students completed during a seven week time period at Physically Active Youth, addressing the organization's desire for an engaging science curriculum for their learners in grades five through seven. The goals of this project were to deliver engaging science lessons to students at Physically Active Youth and leave behind a framework for the continuation of curriculum development.

The accumulation of daily lessons can be found within this binder. The lessons are numbered for the user of the guidebook to see the order in which they were taught, and all worksheets, handouts, activities, etc. for each lesson are attached to the end of each. In addition to this, the team left behind a portal of videos of lesson facilitation for Physically Active Youth staff members to reference for years to come. The team hopes that these videos will help to supplement the guidebook lessons by allowing for staff and volunteers to recreate the lessons and see what methods the team used to conduct the classroom. In addition to a physical copy of all the lessons and a portal of videos on the internet, the team has created a digital copy of all the lessons and videos that can be found on the flashdrive located in the binder and at this link: tiny.cc/WPIDeliverables. This can also be used to access any worksheet for printing purposes.



The table of contents of the guidebook can be found at the beginning of the binder in corresponding colors to the tabs in the filing system. Here, anyone who is looking to teach a lesson should be able to use the table of contents to locate the lesson they wish to use within the guidebook. Before starting the lesson, the educator should read through the entire lesson outline to see if all the materials are available. Additionally, they should carefully read the feedback section found at the end of the lesson that describes what went well and reflection of what should be altered the next time the lesson is taught. The educator should make appropriate changes to the lesson before teaching. The team is hopeful that this guidebook will provide a user-friendly way for future educators to continue facilitation of the lessons implemented during this project.

Lesson 1: Scientific Method



Objectives: Learners will be able

- To understand what the scientific method is
- To identify six steps of scientific method: *observation, question, hypothesis, experiment, analysis, conclusion*
- To develop their own observation, question and hypothesis

Standards Covering: (Taken from Namibian Syllabi)

Standard 1 Follow a sequence of instructions to predict outcome of simple observations and formulate simple scientific questions.

Standard 2 Observe properties such as colour, size, feel, sound, shape, and smell of a variety of substances.

Materials: Pencils and notebooks, beaker, plastic table clothes, paper towels

For Demo: 8 drops food coloring (need red, blue, and yellow coloring), 15 mL liquid dishwashing detergent, 120mL warm water, 3 spoons, 120 mL hydrogen peroxide, 1 packet of yeast, 250mL graduated cylinder

For Student Experiments: (3 Groups, Groups of 10) = 3x Demo Ingredients

Prep-Work: Print worksheets and test the demo once to ensure user understands the outcome

Energizer (5 mins): *Since it is our first full lesson, our goal is to continue to learn names.*

Picnic Name Game: One person says their name and says what they are bringing to the picnic, but it must start with the same letter of their name. Example: Hi my name is Olivia and I am going to bring Olives. The next person needs to repeat the name and food of the person before them, and then add their own name and item. Example: Her name is Olivia and she is going to bring Olives. My name is Ari and I am bringing Apples.

Demonstration (5 mins): *Since it is the first lesson, first introduce and show what graduated cylinders are and explain that they are used for liquid measurements.*

Elephant Toothpaste I:

Create Elephant Toothpaste using the scientific method. Hinting at the first three stages of the scientific method (question, research and hypothesis) think out loud, asking the students “Oh I wonder what will happen if I mix all these ingredients together, my friend told me that it creates elephant toothpaste, so if the yeast packet is mixed with the rest of the ingredients, then something resembling big foamy toothpaste will happen”. Ask for students to help with each step and allow/ask students to observe each ingredient on their own (ie the color, smell, feel etc) before pouring it into the graduated cylinder.

Step 1 Prepare the hydrogen peroxide: Pour 120 mL of hydrogen peroxide into the empty graduated cylinder. *It may be helpful to pre-measure ingredients out so students can just pour from a cup.*

Step 2 Add food coloring: Add 8 drops of food coloring into the graduated cylinder.

Step 3 Add dish soap: Add about 15mL liquid dish soap into the graduated cylinder and swish the graduated cylinder around a bit to mix it. *Ask a different student to feel the temperature of the graduated cylinder. This is important since the chemical reaction is exothermic, meaning it gives off heat when it occurs.*

Step 4 Mix yeast: In a separate cup, combine the warm water and the yeast together and mix for about 30 seconds.

Step 5 Teacher must do - Create foam: Pour the yeast water mixture into the graduated cylinder and observe the reaction. The foam will overflow; so make sure to put the graduated cylinder on a tray or on a washable surface. *Ask the same student as before to feel the temperature of the graduated cylinder. And ask the students to describe what they observed from size, shape, color, smell, temperature. Comparing what was put into the graduated cylinder vs. what was produced.*

Transition (5 mins): Wow! Can someone tell me what they just saw? Did anyone expect that to happen? Well we just used the scientific method during this mini experiment/demo...

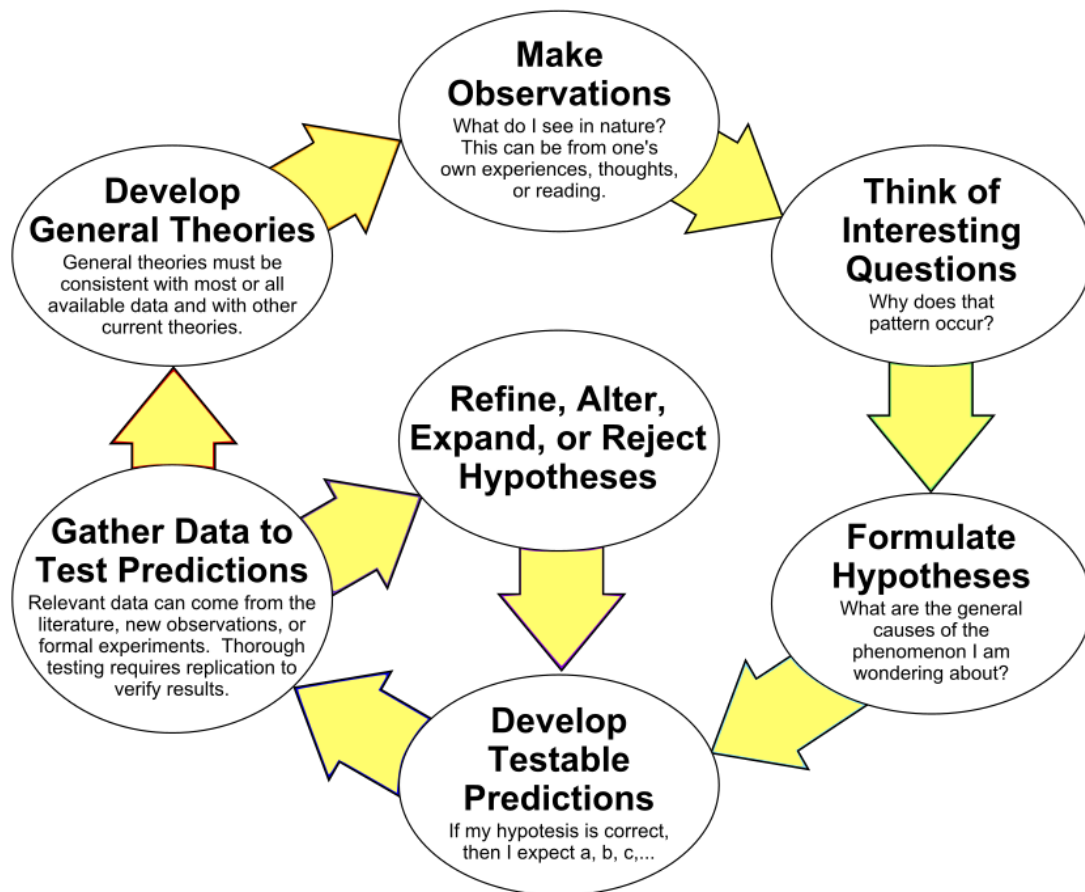
Today we will discuss what the scientific method is, has anyone heard of it before? *If someone raises their hand, have them share out what they know.* “Learning about the scientific method is almost like saying that you are learning how to learn. The scientific method is a process used by scientists to study the world around them. It can also be used to test whether any statement is accurate. You can use the scientific method to study a leaf, a dog, an ocean, or the entire Universe. We all have questions about the world. The scientific method is there to test if your answer was correct. You could ask, "Why do dogs and cats have hair?" One answer might be that it keeps them warm. A good scientist would then come up with an experiment to test whether the statement was accurate. BOOM! It's the scientific method in action.”

Does anyone know what step one is called? *Instructor can write vocab terms on the chalkboard, if no student knows then proceed to introduce them.*

Key Vocabulary (15 mins): Presenting the information on the chalk board have students take notes along with you in their notebooks and create a Quizlet for review

Scientific Method - A way for scientists to study and learn things

The Scientific Method as an Ongoing Process



Question - First step of the scientific method: The objective or problem that you are investigating. Can be written in the form of a question.

From the demo: What happens when I mix these ingredients?

Research - Second stage of the scientific method: Gathering reliable information about your topic to help your experiment.

From the demo: I have spoken to my teacher and she told me what would be created

Hypothesis - Third step of the scientific method: Formulating an *educated* prediction about the outcome of your experiment. A hypothesis is somewhere between a statement and a guess. It is a proposed explanation for something that was observed. A guide to creating a good hypothesis is following: "If _____[I do this] _____, then _____[this]_____ will happen."

From the demo: If the yeast packet is mixed with the rest of the ingredients, then something resembling large toothpaste will happen.

Experiment - Fourth step of the scientific method: Detailed steps that test your hypothesis. It is important to list out all materials and procedure (instructions) step by step (very detailed). It should be written by one person and another person can conduct the experiment exactly with no questions of what to do.

From the demo: I followed my instructions that I had printed out before: *Either have them printed to see, project on the board or read out-loud again.*

Analysis - Fifth step of the scientific method: Closely studying your results and organizing them in graphs, charts, or tables.

From the demo: We didn't collect any specific amounts yet to put into a graph, but we discussed the outcome. What was one thing we noticed? *Let the students remember the temperature difference. Here you can discuss the difference of exo- and endothermic reactions if students are grasping the current concept.*

Conclusion - Sixth step of the scientific method: A written explanation of your experiment - whether your hypothesis was accepted or rejected.

From the demo: In conclusion, we can accept our hypothesis mixing yeast with hydrogen peroxide, dish soap and water it does create a large foaming tower looking similar to what an Elephant Toothpaste may be like.

You always want to follow-up your experiment. Revisit and revise your original hypothesis and experiment. You may have another question to ask and answer this time, like the demo: *What caused to produce so much foam? Does the amount yeast or size of graduated cylinder affect the amount of foam produced?*

Challenge Word of the Day:

Exothermic Reaction - The release of heat during chemical reaction (ie elephant toothpaste; the graduated cylinder warmed up) *May compare the opposite of Endothermic Reaction - requiring the absorption of heat (ie ice cubes melting).*

Activity (15 mins):

Elephant Toothpaste II: Develop Well Written Hypothesis and Procedure

Have the learners get into three groups and assign each team with a different problem/question to answer. It is up to them to pull from prior knowledge about color to create a correctly formulated hypothesis, well written out procedure before conducting their own experiment to test out.

Potential Questions for Groups: *You can repeat questions for different groups.*

1. How do you make green toothpaste?
2. How do you make orange toothpaste?
3. How do you make black toothpaste?
4. How do you make purple toothpaste?
5. How do you make pink toothpaste?
6. How do you make white toothpaste?
7. How do you produce the most foam? *This can be used for an older group who may have background or want a challenge. An educator can go into detail if want: Elephant toothpaste is the decomposition process of hydrogen peroxide, while yeast/potassium iodide works as a catalyst to break down the hydrogen peroxide into oxygen and water. Soap will then mixed with the oxygen and water, which turn into foam. The students can adjust the amount of material they pour in.*

Each group needs to write down their hypothesis and procedure, raise their hand for an educator to have it checked before they are given the supplies to conduct their experiment. *It is up to the educator and the time constraint but you can either have one group perform their experiment at a time in front of the class or let them do it on their own and then share their findings to the rest of the class at the end.*

All experiments MUST be over a plastic tablecloth as a mess will be create. This ensures an easy clean up. Wash out all graduated cylinders and save for future use.

If there is a lot of time or students are waiting around students can

1. *Write down their conclusion (hypothesis was accepted or rejected because of X)*
2. *If time and supplies permit: conduct another experiment to either adjust hypothesis, retest etc.*
3. *Give them a challenge of seeing how many water bottle flips they can do with a plastic water bottle. Give them the question of what is the best liquid amount to have in the water bottle to get the most flips? Have them each make a personal hypothesis.*

Debrief/Recap (5 mins):

Why should we do multiple trials of an experiment? *Start to think about proving your hypothesis, mishaps, careful about measuring etc..*

What is one take away about scientific method?

Any other comments or questions about a scientific method?

What were the differences in the materials that were put into the graduated cylinder vs what came out?

This is an example of what? *An experiment, more specifically a chemical reaction, an exothermic reaction.*

Did we like this activity?

Tomorrow we will talk more about how to measure different types of data and the proper equipment to use.

Worksheet (in class team assignment): Filling in examples and definitions for each step of the scientific method. *We are planning on facilitating the interactive activity, however P.A.Y. asked that we leave worksheets with them for future use. This is the worksheet we will leave them with. It can also be completed by the students the next day during the homework hour if they don't have any homework.*

Lesson Plan for Next day: Review the steps of the scientific method from the day before, but focus on the experiment portion specifically the ways to collect data using different equipment. Teach how to differentiate between quantitative and qualitative data. Learn to measure and record with different materials.

Future Lessons: Use data collected from previous lessons to formulate correct graphs (pie chart, bar graph, line graph etc). Learn the different parts of each graph (X and Y axis, headings etc).

Sources:

Elephant Toothpaste: <https://sciencebob.com/fantastic-foamy-fountain/>

Explanation of Scientific Method: http://www.biology4kids.com/files/studies_scimethod.html

Flowchart: http://bowenpeters.weebly.com/uploads/8/1/1/9/8119969/scientific_method_handout.pdf

Name Game: <http://www.ultimatecampresource.com/site/camp-activity/action-syllables.html>

Scientific Method Worksheet:

<https://feelslikehomeblog.com/2017/07/teaching-the-scientific-method-a-free-printable/>

Online Game using Vocabulary: <https://www.brainpop.com/games/mobscientificmethod/>

Online Game Testing Order of Scientific Method: <https://www.quia.com/rd/7331.html>

Vocabulary:

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Feedback: We had a bit of a time crunch and had to move the student experiment to the following day. We filled our time demonstrating the experiment and then completed the experiment, results, and conclusion sections of the worksheet the next day. Note: Write out the procedure on the chalkboard to help students condense all the information into the small box on their worksheet. Make sure the stronger students are dispersed throughout the classroom to help with filling out the worksheet.

The lesson took two days to complete, the first day the students saw the demo and then broke up into three groups for their own experiment. We assigned each group a color to try to create. they had to write out their research, question, hypothesis and procedure so the next day they are ready to conduct the experiment

This experiment was used as a reference for the rest of the lessons and a great visual to get all the students excited about science. Two seventh graders ask to take the supplies to school to conduct it for their class which was another great success and accomplishment knowing they had the confidence and excitement to share with others.

The scientific method

question	research/observation
hypothesis	
experiment	
materials <ul style="list-style-type: none">•••••	procedure <ol style="list-style-type: none">1.2.3.4.5.
results	
conclusions	
new questions/notes for next time	

MEMORANDUM

The scientific method

question

How do I make green/orange/purple elephant toothpaste?
(Adjust following answers to the color that the student was assigned)

research/observation

I know from looking at the color wheel that blue and yellow make green.

hypothesis

If yellow and green food coloring is added to the graduated cylinder, then green elephant toothpaste will be created.

experiment

materials

- Primary Color Food Coloring
- Hydrogen Peroxide
- Dish Soap
- Yeast and Water
- Spoons/Graduated Cylinder

procedure

1. Pour Hydrogen Peroxide into Graduated Cylinder
2. Add Food Coloring
3. Add Dish Soap
4. Mix Yeast and Water in Separate Container
5. Pour Yeast and Water into Grad. Cyl. and Stand Back!

results

Green foam was produced!

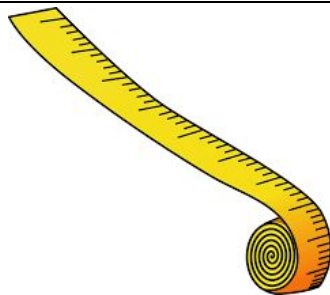
conclusions

In conclusion, we can accept our hypothesis that mixing yellow and blue food coloring will create green elephant toothpaste.

new questions/notes for next time

Any questions here that the students have after completing the experiment (Ex. How do we make bigger foam?)

Lesson 2: Measurements



Objectives: Learners will be able to use instruments to take different measurements.

Standards Covering: (Taken from Namibian Syllabi)

Standard 1 Record estimates and measurements of simple observations through drawing and discussion.

Standard 2 Estimate and measure:

- Length, mass, time and temperature
- The height of fellow learners

Standard 3 Follow sequence of instructions; use appropriate techniques; handle apparatus/material competently and have due regard for safety.

Materials: 3 beakers, water, 3 thermometers, rulers, tape measures (if available)

Prep-Work: Put water in all three beakers. Place one outside in the sun, place one in the refrigerator, and place one on a table in the classroom. Make sure all of the other objects in the scavenger hunt are easily accessible in the classroom.

Energizer (5 mins): *Name Game*

Gather everyone in a circle to play Action Syllables game. Have the participants each choose an action for every syllable of their name. Example: Elvis has 2 syllables, so he does a hip shake with a snap with his fingers. Once Elvis has done his action while saying his name, the whole group repeats. After the second person does his/her name, the whole group repeats, then does Elvis's again. And so on until everyone has done it.

Key Vocabulary:

Thermometer - An instrument for measuring temperature

Celsius - Unit of temperature, water freezes at 0°, water boils at 100°

Tape Measure - Length of tape or thin flexible metal, marked at intervals for measuring

Kilometer - A metric unit of measurement equal to 1,000 meters

Millimeter - One thousandth of a meter, 0.001 meters

Instruction (15 mins):

- Review the steps of the scientific method
- Focus on the experiment portion, specifically the ways to collect data using different equipment
- Differentiate between quantitative and qualitative data.

Probing Questions: Read off questions and ask students to think about how they're related

- How much does an elephant weigh?
- What is the distance between P.A.Y. and your home?
- How long does a soccer game last?
- How old are you?
- How big is the earth?

They are all examples of measurement. We measure things all the time. Ask students why we take measurements.

- *That's how we compare one thing to another. Measurement helps us describe the world.*

Now, give example of building a house. Ask what type of measurements are needed to make this happen?

- *We need to know the measurements of how big the house is going to be so that we can make the walls and the roof the same size.*

Measurements are all around us and there are so many different types. Ask students to brainstorm types of measurements.

- *Temperature, length, height, mass.*

How is temperature measured and what's the scale? *Thermometer (Celsius or Fahrenheit)*

How is length measured? *Ruler, tape measure, meter stick,*

What are different units of measurement for length? *Meter, centimeter, kilometer, millimeter*

Activity (35 mins):

- 1. Measurement Scavenger Hunt** Have students break off into pairs to complete the scavenger hunt (attached at the end of the lesson).
- 2. Body part estimation and measurement** for extra practice if there is time. Use rulers and tape measures to complete the measurement chart.

Debrief/Recap (5 mins): Have students paste their scavenger hunt worksheets in their workbooks.

Who found the book that was 21.5 cm?

Who can give the temperature of the water in one of the cups?

What was the diameter of the plate?

Who got the diameter, could anyone calculate the circumference?

Did anyone find the height of Gavin?

Lesson Plan for Next day: Create graphs given measurements and other data
Future Lessons: Use data collected from previous lessons to formulate correct graphs

Feedback: This lesson was pretty hectic, which was expected because that is the nature of a scavenger hunt. In the future, we suggest avoiding activities that are this hectic. Some of the students were able to do the scavenger hunt well, while the younger students struggled and ended up copying answers from the older students. Partner activities don't work out very well with so many students. Rather students should work in larger groups of 4 or 5.

In addition, the chalkboard notes should be more organized. This should either be done using a worksheet that guides the students through the notes, or the notes should be written out on the board exactly how students should copy them into their notes.

Finally, we learned that the learners struggle with understanding units and unit conversions. A lesson was added to practice unit conversions. Examples of objects that are equal to 1 km, 1 meter, 1 cm, and 1 mm should be given. More work can be done in this area.

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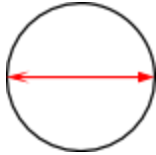
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Classroom Scavenger Hunt

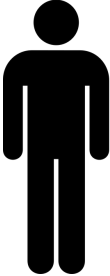



<p>Find a book that has a height of 21.5 cm.</p> <p>Book title: _____</p>	<p>What is the height of 3 bricks?</p> <p>Height: _____</p>
<p>What is the temperature of the water in the cup outside?</p> <p>Temperature: _____</p>	<p>What is the height of one classroom chair?</p> <p>Height: _____</p>
<p>What is the length of 4 tiles on the floor?</p> <p>Length: _____</p>	<p>What is the length of the green scissors in the classroom?</p> <p>Length: _____</p>
<p>What is the temperature of the water in the cup in the classroom fridge?</p> <p>Temperature: _____</p>	<p>What is the temperature of the water in the cup in the classroom?</p> <p>Temperature: _____</p>
<p>Find an object in the classroom that is between 10 and 20 cm in length?</p> <p>Object: _____</p>	<p>What is the diameter of the plate? <i>Hint: a diameter is the length across a circle</i></p>  <p>Diameter: _____</p>
<p>CHALLENGE QUESTION</p> <p>What is the height of Gavin?</p> <p>Height: _____</p>	<p>CHALLENGE QUESTION</p> <p>What is the circumference of the plate? (Circumference = 3 x diameter)</p> <p>Circumference: _____</p>

MEMORANDUM

Classroom Scavenger Hunt

<p>Find a book that has a height of 21.5 cm.</p> <p>Book title: <u>answers will vary</u></p>	<p>What is the height of 3 bricks?</p> <p>Height: <u>answers should range from 24.5-26.5 cm</u></p>
<p>What is the temperature of the water in the cup outside?</p> <p>Temperature: <u>34 - 36 ° C</u></p>	<p>What is the height of one classroom chair?</p> <p>Height: <u>78 cm</u></p>
<p>What is the length of 4 tiles on the floor?</p> <p>Length: <u>135 cm</u></p>	<p>What is the length of the green scissors in the classroom?</p> <p>Length: <u>13 cm</u></p>
<p>What is the temperature of the water in the cup in the classroom fridge?</p> <p>Temperature: <u>~17 ° C</u></p>	<p>What is the temperature of the water in the cup in the classroom?</p> <p>Temperature: <u>30 ° C</u></p>
<p>Find an object in the classroom that is between 10 and 20 cm in length?</p> <p>Object: <u>answers will vary</u></p>	<p>What is the diameter of the plate? Hint: a diameter is the length across a circle</p> <p>Diameter: <u>22 cm</u></p>
<p>Challenge Question What is the height of the door?</p> <p>Height: <u>194 cm</u></p>	<p>Challenge Question What is the circumference of the plate? (Circumference = 3.14 x diameter)</p> <p>Circumference: <u>~70.5 cm</u></p>

Learner Measurements

Body Part	Estimate	Measurement
Whole body 		
Wingspan 		
Foot 		
Thumb 		

ANSWERS WILL VARY

Lesson 3: The Basics of Graphs



Objectives: Learners will be able understand, create, and analyze different types of graphs.

Standards Covering: (Taken from Namibian Syllabi)

Standard 1 Identify key differences between bar graphs, line graphs, pie charts, and pictographs.

Standard 2 To create a basic graph using data that is provided.

Standard 3 To analyze and draw conclusions from graphs.

Materials: Chalk, Graph Paper, Pencils, Rulers

Prep-Work: Rip out graph paper and have rulers ready for students to use during the activity.

Energizer (5 mins): Have all students stand in the middle of the room. Ask one question at a time that has two options so the students can pick which they like best. Depending on the option they choose they should pick the corresponding side of the room. (Example: Do you like chocolate or vanilla ice cream? Students who prefer chocolate ice cream go to the left side of the room and students who prefer vanilla ice cream go to the right side of the room.)

Transition (5 mins): Now, imagine someone walked in here, for example Ursula, and wanted to know our class's favorite ice cream flavor or favorite sport. What are some ways we could show her?
The easiest way to do this would be by collecting data (usually quantitative data) and putting it into a graph.

Instruction (30 mins): Pass out a piece of graph paper to every student and have them fold it in half two times, so that they have four boxes. Tell the students we will be learning about four

different types of graphs, and we will sketch them quickly so there is no need for rulers or colored pencils/markers.

Can anyone tell me one type of graph that they know?

Discuss and explain the types of graphs outlined below using the chalkboard and having students take notes. Routinely ask if any student has any questions.

Bar Graph – Typically consists of vertical or horizontal columns where the peak of the bar represents the value of that category. The greater the length of a bar in a bar graph (or the greater the height), the greater the value. They are used to compare a single **variable** between several groups for example what is the favorite sport of students at P.A.Y.?

- Create bar graph on the blackboard
- Take a quick poll of the class to determine the favorite sport, either soccer, cycling or chess
- Sketch a graph of these results on the board and have the students follow along making sure they are only creating a **quick**, rough, sketch
- Make a point to show what the variable is (factor that is being compared is the type of sport)
- Have students analyze the graph: *Can anyone tell me the most popular sport? What about the least popular sport?*

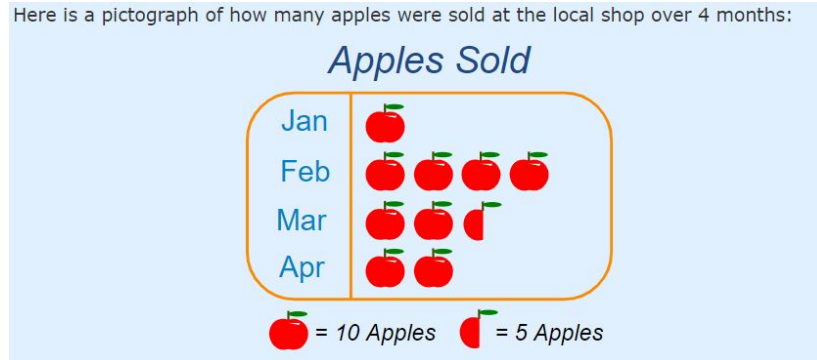
Line Graph – Typically a graph that is commonly used to show **change over time**. Time is on the X axis (horizontal axis) and the number of occurrences is on the Y Axis (vertical axis). The steeper line between two dots on a line graph, the greater change there was in that time. If the line is flatter between two points that means, there was less change over that period of time.

- Example: Yesterday we paid close attention to the number of students who arrived to PAY over time.
- At 1:00 there were 12 students here, at 1:15 there were 40 students here, at 1:30 there were 50 students here and at 2:00 there were 90 here.
- Create the graph on the board plotting the points and connecting the points to show the change in slope.
- Have students analyze the graph: *Can anyone tell me when the greatest change occurred? Where the least change occurred?*

Pie Charts – Typically used to show the distribution or classes of data in proportion to the total data set. In a pie chart the entire circle represents all of the data or 100% while each piece of the pie represents a portion or fraction of the whole.

- Example of this can be a breakdown of the percentage of the most popular sports of students at PAY. Based on graph we made earlier, which sport would have the biggest piece of the circle?
- Draw a pie graph or have one made of something the kids can relate to and have them analyze the chart.

Pictograph – Pictographs are called pictographs because they use a picture to represent their data. Pictographs are very similar to bar graphs but they make graphs more interesting to look at. One cool thing about pictographs is that they need to have a **key**. A key is needed to show people what the picture represents. For example:



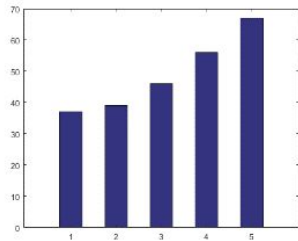
- Notice how some of the apples are full but some of them are half apples. The key at the bottom shows how many apples each picture represents
- *Can anyone tell me how many apples were sold in the month of February? Keep in mind to use the key in order to make sure you have the right number.*
- *What about the number of apples sold in the month of March?*

Key Vocabulary (10 mins):

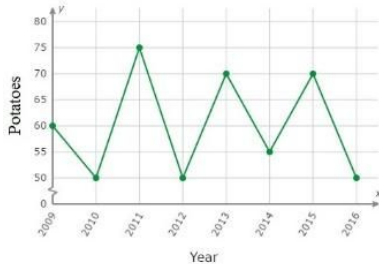
Axis – A fixed reference line used for the measurement of data

Slope – The steepness of a line between two data points

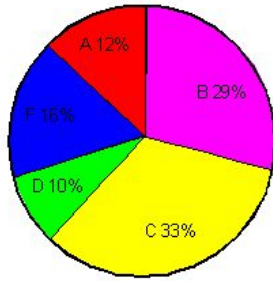
Bar Graph – A graphical display of data using bars at different heights



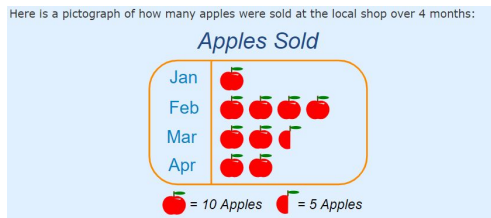
Line Graph – A graphical display of data that shows change over time



Pie Graph – A graphical display that can show portions of a whole



Pictograph – Another way to represent data but in the form of pictures



Analyze - To look at something closely in order to learn something in great detail.

Activity (20 mins): Hand out the worksheet on data and have students work with a partner to create the graphs necessary to represent the data sets given.

Debrief/Recap (5 mins):

What are the 4 main types of graphs we learned about today?

When do we use each of these types of graphs?

What do we look for to read or analyze graphs?

Sources:

<https://www.mathsisfun.com/data/bar-graphs.html>

<https://www.mathsisfun.com/data/line-graphs.html>

<https://www.mathsisfun.com/data/pie-charts.html>

<https://www.mathsisfun.com/data/pictographs.html>

Worksheet: https://westernreservepublicmedia.org/quizbus/images/vid2_variety.pdf

Works Cited (Citations):

Sources in Alphabetical Order:

(n.d.). Retrieved from <https://www.mathsisfun.com/data/pictographs.html>

(n.d.). Retrieved from <https://www.mathsisfun.com/data/pie-charts.html>

(n.d.). Retrieved from <https://www.mathsisfun.com/data/line-graphs.html>

(n.d.). Retrieved from <https://www.mathsisfun.com/data/bar-graphs.html>

Axis (graph). (n.d.). Retrieved from <https://www.mathsisfun.com/definitions/axis-graph-.html>

Bar Graph. (n.d.). Retrieved from <https://www.smartdraw.com/bar-graph/>

Line Graph. (n.d.). Retrieved from <https://www.smartdraw.com/line-graph/>

Photos in Order of Appearance:

Business Graph (n.d.). Retrieved from

<https://www.publicdomainpictures.net/en/view-image.php?image=31318&picture=business-graph-success>

(n.d.). Retrieved from <https://www.mathsisfun.com/data/pictographs.html>

Bar. (n.d.). Retrieved from https://www.mathworks.com/help/matlab/creating_plots/overlay-bar-graphs.html

Tutorialspoint.com. (n.d.). Interpreting a line graph. Retrieved from

https://www.tutorialspoint.com/tables_graphs_functions_and_sequences/interpreting_line_graph.htm

Pie graph. (n.d.). Retrieved from <https://whatis.techtarget.com/definition/pie-graph-or-pie-chart>

Feedback: Due to time constraints, WPI students were unable to teach this lesson to the students. If the lesson proves too much content, it can be split into two days.

A Variety of Graphs: Sample Data

Line Graph

Title: _____

Time (sec)	Volume (ml)
0	300
10	260
20	220
30	180
40	140
50	100
60	60

Check for understanding:

- Will this graph show an increasing or decreasing trend?
- What real-life example might this data represent?

Circle Graph

Title: _____

Flavor	Number of Boxes Sold
Chocolate Chip	36
Sugar	47
Oatmeal	18
Coconut	63
Mint	132
Other	23

Check for understanding:

- How many boxes of cookies were sold altogether?
- Could this data be shown using another type of graph? If yes, which type?
- What percent of the cookies sold were sugar cookies?

Bar Graph

Title: _____

School	Pupil Population
Ravenna HS	930
Theodore Roosevelt HS	1,300
Hoover HS	1,700
McKinley HS	900
Stow-Munroe Falls HS	2,000

Check for understanding:

- If this data were to be presented in pictograph form, what symbol might you use?
- How many pupils would each picture represent?

Histograms

Title: _____

Grade	Minutes of Homework per Day
K-2	10
3-5	30
6-8	45
9-11	70

Check for understanding:

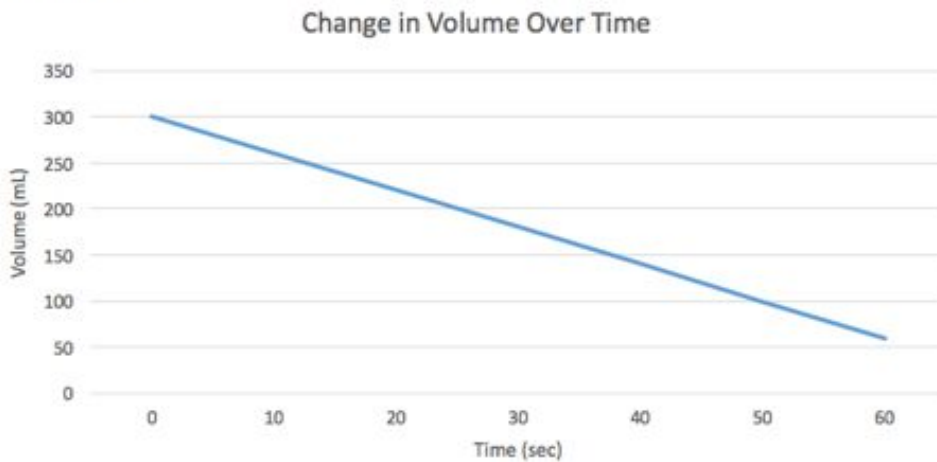
- Will this graph show an increasing or decreasing trend?
- Could this data be shown using another type of graph? Explain your answer.

MEMORANDUM

Name _____

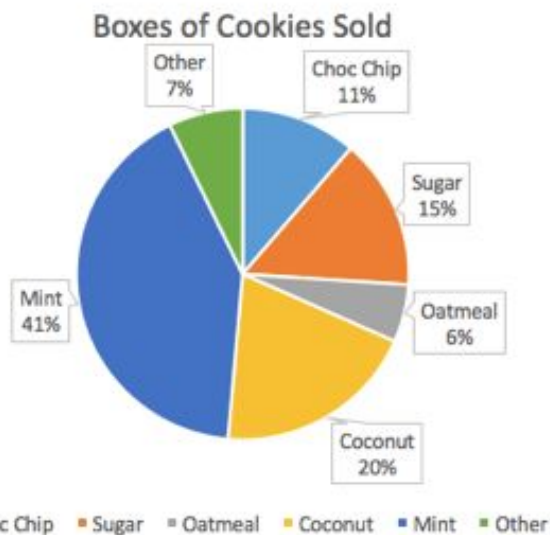
A Variety of Graphs: Sample Data

Line Graph



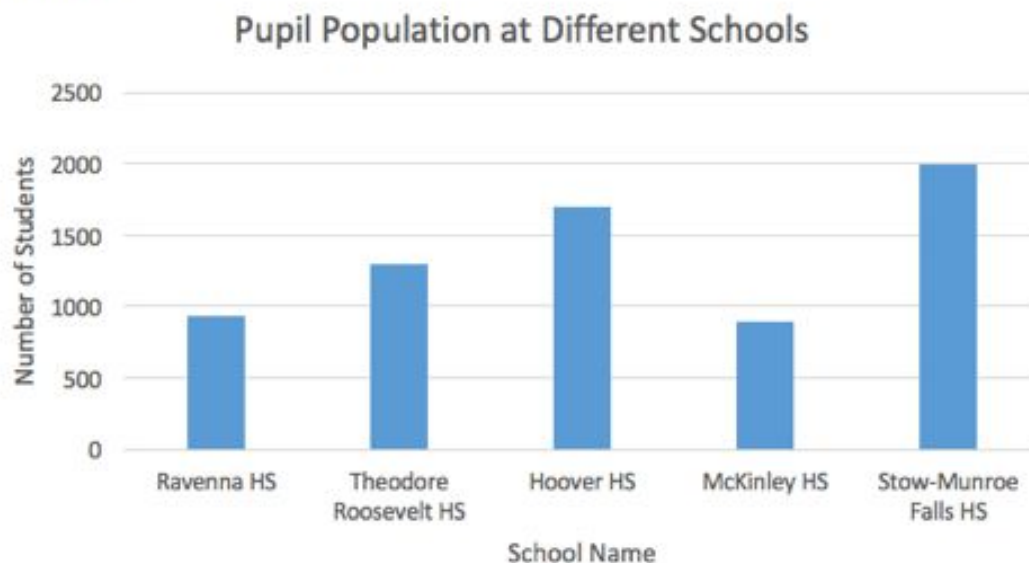
- This Graph shows a decreasing trend
- Example: Water being poured out of a beaker

Circle Graph



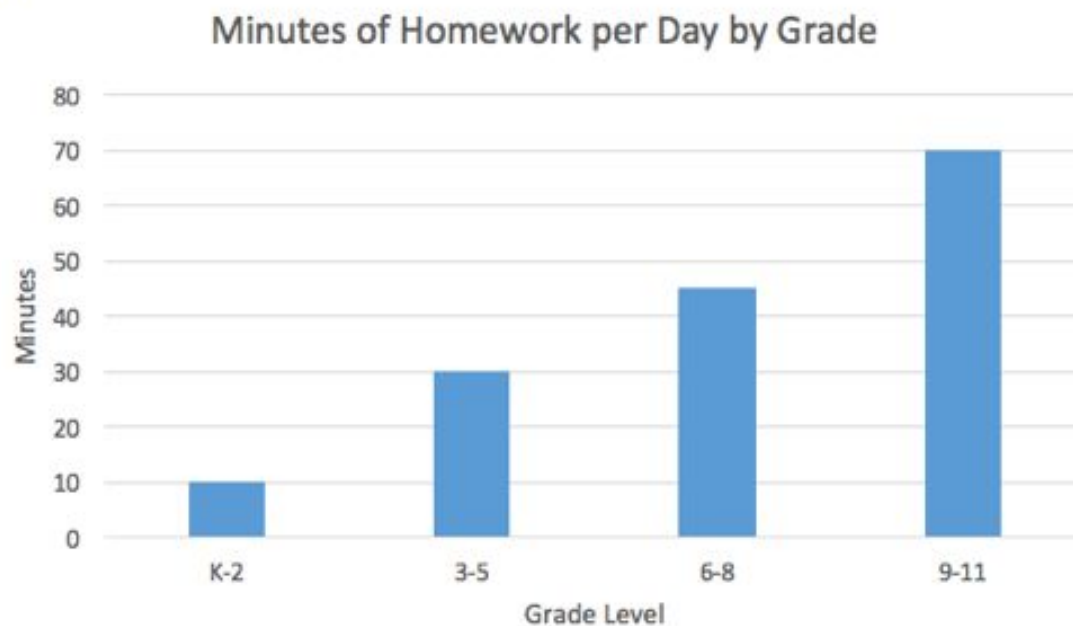
- 319 boxes of cookies were sold altogether
- Yes it could be shown another way: Bar Graph
- 15% of the cookies sold were sugar cookies

Bar Graph



- Pencils, students, apples, etc.
- 200 students, 500 students, etc.

Histogram



- This graph shows an increasing trend
- Yes, a bar graph is the best graph for this data

Make sure students title all graphs and label all axes*

Lesson 4: Life Skills Scientific Method Week
Why is science so important?



Objectives: Learners will be able

- *Recognize the importance of science education*
- *Identify different STEM related career paths*
- *Understand the roles of different science jobs*

Materials: Paper for airplanes, map (can be hand drawn), markers, alka seltzer packets, balloons, empty water bottle

Prep-Work: Prepare powerpoint and hang map

Energizer (5 mins): Random energizer/ice-breaker or review some topics from the week

Transition (5 mins): This week we learned about the scientific method, and now we are going to talk about how science and the scientific method can be used in the field. *Instructor can write vocab terms on the chalkboard, if no student knows then proceed to introduce them.*

Key Vocabulary (10 mins): Presenting the information, creating Quizlet for review

Chemist - a person engaged in chemical research or experiments

Astronaut - a person who is trained to travel in a spacecraft

Engineer - a person who designs, builds, or maintains machines or structures

Geographer - an expert in the study of the features of the earth and its atmosphere

Challenge Word of the Day:

Primatologist - a person who studies both living and extinct primates in their natural habitats and in laboratories to understand aspects of their evolution and behaviour

Activity (15 mins):

- Rotating three group activity:

- Each group will go around to the three groups identified below and will complete the activity and learn about the specific job

Group 1: Engineer - Paper airplane contest and discussing/Q&A on what engineers do

Group 2: Chemist - Experiment (Alka-Seltzer blowing up balloon, procedure below) and review of scientific method; discuss why the experiment works

- **Materials:**
 - Small bottle
 - Alka Seltzer/Eno (Any Antacid)
 - Water
 - Balloon
- **Procedure:**
 - Blow up the balloon first and then let the air out in order to stretch it
 - Fill the bottle with water, keeping the top open
 - Drop the alka seltzer into the bottle and quickly place the balloon on the top
 - Watch as the balloon blows up

Group 3: Geographer - Map activity (Talk about travelling and knowing where places are, have them mark on the map where they want to go most!)

Note: If you can't have three groups, the instructor can do demonstrations to the whole class

Debrief/Recap (10 mins): Discussion

What was your favorite thing you did or learned today?

Why is science important?

Worksheet (in class team assignment): Have the students write down what they want to be when they grow up! (Use this to understand students' goals and guide them towards achieving them)

Lesson Plan for Next Day: Topic for next week will be **Matter**

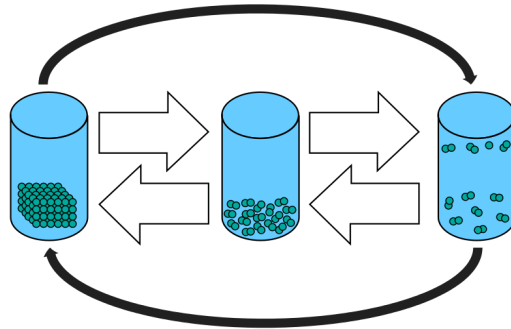
Feedback: Due to time constraints, WPI students were unable to go over vocabulary words astronaut and primatologist.

Works Cited (Citations):

Photos in Order of Appearance:

Pitr. (2014, February 10). Lab Icon 2. Retrieved from http://www.publicdomainfiles.com/show_file.php?id=13920210611741

Lesson 5: Introduction to Matter



Objectives: Learners will be able to understand the three major states of matter and describe the three states at an atomic/molecular level.

Standards Covering: (Taken from Namibian Syllabi)

Standard 1 Know of materials which can exist in different forms (States of Matter) and name common substances which can appear in two or more forms.

Standard 2 Understand that all materials have mass.

Materials: Beakers, Ice, Tape, Balloon, Pencils

Prep-Work: Set out three beakers, put ice in one, water in another, and leave the third beaker empty. These are used to represent the solid, liquid, and gas phases of water. Blow up two balloons and place tape around the outer circumference of one of the balloons. This will be the balloon that will be placed in the freezer later on.

Energizer (5 mins): Name Game Energizer (Everyone says their name and a fun fact)

Instruction (30 mins): Introduction to Matter

Can anyone tell me what matter is or where I could find it?

Would you believe me if I told you that you were sitting on matter?

What about if I told you that you just ate matter?

What about if I told you that you are breathing matter?

Explain what matter is and how it applies to the student's daily lives.

- *Matter is defined as anything that has mass and takes up space or has volume.*

Connect atoms to matter.

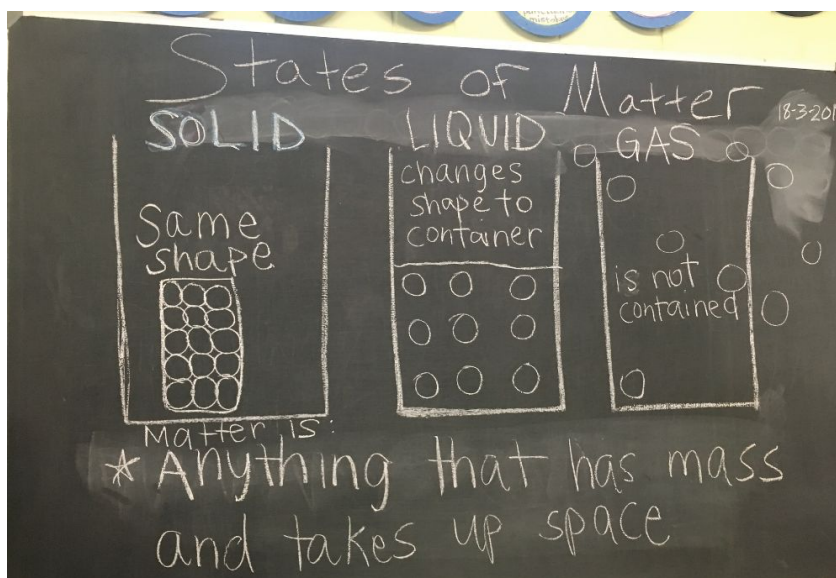
- *All matter is made up of atoms which are the smallest unit of measurement and physically cannot be divided. Atoms are so small that no one can see them without a very powerful and expensive microscope.*

Help the students understand how small atoms are by comparing the size of an atom to a 1 Namib coin: 2.3044×10^{22} atoms in a 1 Namib coin - write this number on the board with all of the zeros.

Explaining States of Matter:

Use water as an example to show the three states of matter - show the beakers with ice, water, and gas - *The 3 major states of matter are solid, liquid, and gas. The reason water can be found in these 3 different states is because of temperature which affects the energy or movement of atoms.*

Draw "atoms" on the blackboard showing how they are tightly packed together in the solid phase, a little spread out in the liquid phase, and very spread out in the gas phase. Have students write this down in their notebooks.



After the students are done writing, show them two balloons and place one in the freezer.

Activity (30 mins): Take all of the students outside into the courtyard and have kids act out the different phases of matter. Each student represents an atom or molecule.

For solid they should all stand close together and be still, liquid they should walk normally around in random directions within the boundaries, gas they should walk quickly/jog around with no boundaries.

Keep calling out different phases until everyone develops a good understanding.

Bring the students back inside and distribute the day's worksheet for them to complete.

Key Vocabulary:

Matter - Anything that has mass and takes up space or has volume.

Atom - The smallest particle of matter and the smallest form anything can exist in. All substances are made up of atoms.

Molecule - A type of particle that is made up of two or more atoms.

Solid - Atoms are very closely packed together and are firm and stable in shape.

Liquid - Atoms are close and moving around freely and will take the form of its container.

Gas - Atoms and molecules move more freely and quickly and bounce off the walls of its container.

Debrief/Recap (5 mins): Review the three states of matter and how the atoms behave in each of the stages: What are some substances other than water that can exist in two or more forms? Take out the balloon from the freezer and show the students how it shrunk overtime.

Why did the balloon get smaller?

The air molecules got colder in the freezer which gave them less energy. As a result they move slower and closer together making the balloon get smaller.

Lesson Plan for Next day: Investigating Matter - Use measuring skills learned from the previous week to get a deeper understanding of the phases of matter.

Future Lessons: Compare stages of matter between different substances, go deeper into how temperature affects the stages of matter, atomic structure.

Sources:

States of Matter by Chris Oxlade

http://www.chem4kids.com/files/matter_intro.html

<https://www.education.com/lesson-plan/whats-the-matter-solids-liquids-and-gasses/>

Worksheet: https://www.superteacherworksheets.com/matter/matter1_WMTBR.pdf?up=1466611200

Works Cited (Citations):

Sources in Alphabetical Order:

Education.com. (2018, June 13). What's the Matter? Solids, Liquids, and Gases! | Lesson Plan | Education.com |

Lesson plan. Retrieved from <https://www.education.com/lesson-plan/whats-the-matter-solids-liquids-and-gasses/>

Studios, A. R. (n.d.). Matter is the Stuff Around You. Retrieved from

http://www.chem4kids.com/files/matter_intro.html

Photos in Order of Appearance:

Enoshd. (2014, October 22). States of Matter Template. Retrieved from

<https://commons.wikimedia.org/wiki/File:States-of-matter-template.svg>.

Feedback: The amount of material in this lesson was good to fill the hour and a half time frame. The notes were a little bit confusing for the students. One lesson should be added before this lesson to go over what matter is in general and what atoms are. The term atom should be described in better detail and more time should be spent on the atom. The term molecule can also be introduced here. Then, this lesson should be taught to introduce the states of matter, but the states of matter shouldn't be taught without going over what matter is. The states of matter could also have been defined in a simpler way using the terms shape and volume instead of energy as outlined below.

Solid - A substance that has a definite shape and a definite volume. Its shape does not change when you put it into different containers.

All substances (solids, liquids, and gases) are made up of tiny particles that are too small for the eye to see. In a solid each particle is joined strongly together. This means that they are in fixed positions and they cannot move. Ex: Solids are like a bunch of people standing still.

Liquid - A substance that flows to fill the bottom of the container that it is in. A liquid does not have a definite shape, but it does have a definite volume.

The particles in a liquid are close together, but they are free to move around. Ex: a bunch of people in a room walking around.

Gases - A substance that expands to fill the container that it is in. A gas does not have a definite shape, which means it can flow and change shape. A gas does not have a definite volume, which means it can spread out to fill the container that it is in.

Gas particles move very quickly and sometimes they collide with each other. Ex: a bunch of people in a room running around, bouncing off of the walls and bumping into each other.

Name: _____

What's the Matter?



Tell whether each is a solid, liquid, or gas.

- | | |
|-------------------------|---------------------------|
| 1. milk - _____ | 2. cookie - _____ |
| 3. oxygen - _____ | 4. fish - _____ |
| 5. pencil - _____ | 6. maple syrup - _____ |
| 7. shampoo - _____ | 8. carbon dioxide - _____ |
| 9. ice cube - _____ | 10. paint - _____ |
| 11. oil - _____ | 12. salt - _____ |
| 13. water vapor - _____ | 14. gasoline - _____ |
| 15. helium - _____ | 16. sand - _____ |

Complete each sentence with the word **solid**, **liquid**, or **gas**.

A _____ has a definite shape. It does not take the shape of its container. It also has a definite volume because it can be measured.

A _____ does not have a definite shape. It takes the shape of its container. It does have a definite volume because it can be measured.

A _____ does not have a definite shape. It sometimes takes the shape of its container and sometimes flies freely around you. These particles are not connected to each other and takes up whatever space is available.

ANSWER KEY

What's the Matter?



Tell whether each is a solid, liquid, or gas.

- | | |
|------------------------------|--------------------------------|
| 1. milk - liquid | 2. cookie - solid |
| 3. oxygen - gas | 4. fish - solid |
| 5. pencil - solid | 6. maple syrup - liquid |
| 7. shampoo - liquid | 8. carbon dioxide - gas |
| 9. ice cube - solid | 10. paint - liquid |
| 11. oil - liquid | 12. salt - solid |
| 13. water vapor - gas | 14. gasoline - liquid |
| 15. helium - gas | 16. sand - solid |

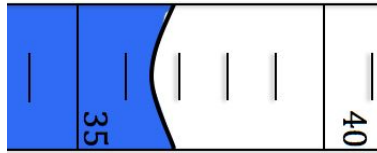
Complete each sentence with the word **solid**, **liquid**, or **gas**.

A **solid** has a definite shape. It does not take the shape of its container. It also has a definite volume because it can be measured.

A **liquid** does not have a definite shape. It takes the shape of its container. It does have a definite volume because it can be measured.

A **gas** does not have a definite shape. It sometimes takes the shape of its container and sometimes flies freely around you. These particles are not connected to each other and takes up whatever space is available.

Lesson 6: Investigating State and Volume Changes



Objectives: Learners will know how to make and record measurements of volume. Learners will use thermometers to measure the temperature of water. Learners will use the scientific method to conduct an experiment on the changes of state and volume.

Standards Covering: (Taken from Namibian Syllabi)

Standard 1 Follow sequence of instructions; use appropriate techniques; handle apparatus/material competently and have due regard for safety.

Standard 2 Study and observe that when ice melts it forms water and when water evaporates it becomes a vapour.

Materials: Ice cubes, work sheets

Prep-Work: Fill a tray of ice cubes the night before. Put food coloring into the ice tray to make the ice colorful.

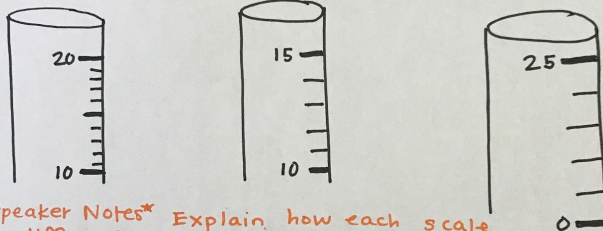
Energizer (5 mins): Elimination game on the checkerboard outside using the solid, liquid, gas moving game from the day before. When we say solid the students should find another student or a group of students and stand still next to them. When we say liquid the students should be walking around the checkerboard but not leaving its boundaries. When we say gas the students should move very quickly and can leave the bounds of the board. If any student does the movement incorrectly or if they are the last student to get in order, they are out. The winner is the last student participating in the game.

Key Vocabulary:

Volume - the amount of space that a substance or object occupies

Chalkboard Notes

Volume is the amount of space that an object occupies.



Speaker Notes Explain how each scale is different. Then explain how the students must count the lines inbetween the labelled lines to figure out what each line represents. Show them examples with these graduated cylinders and then have them practice on their own.

Activity: State and Volume Changes

- Students will be observing the change of state of water from ice to liquid and the change of volume that occurs when ice melts.
- Each group will get a beaker or a graduated cylinder on their desk. This will then be filled with warm water.
- They will be asked to measure the volume of water in the graduated cylinder. Then each group will receive ice cubes and put them into the warm water.
- The students will be asked to make observations about what is happening to the ice cubes (ice cubes will be colored with food coloring so that they can be seen clearly).
- Finally, students will be asked to measure the final volume of the water. Advanced learners will be asked to calculate the volume of the ice by finding the change.

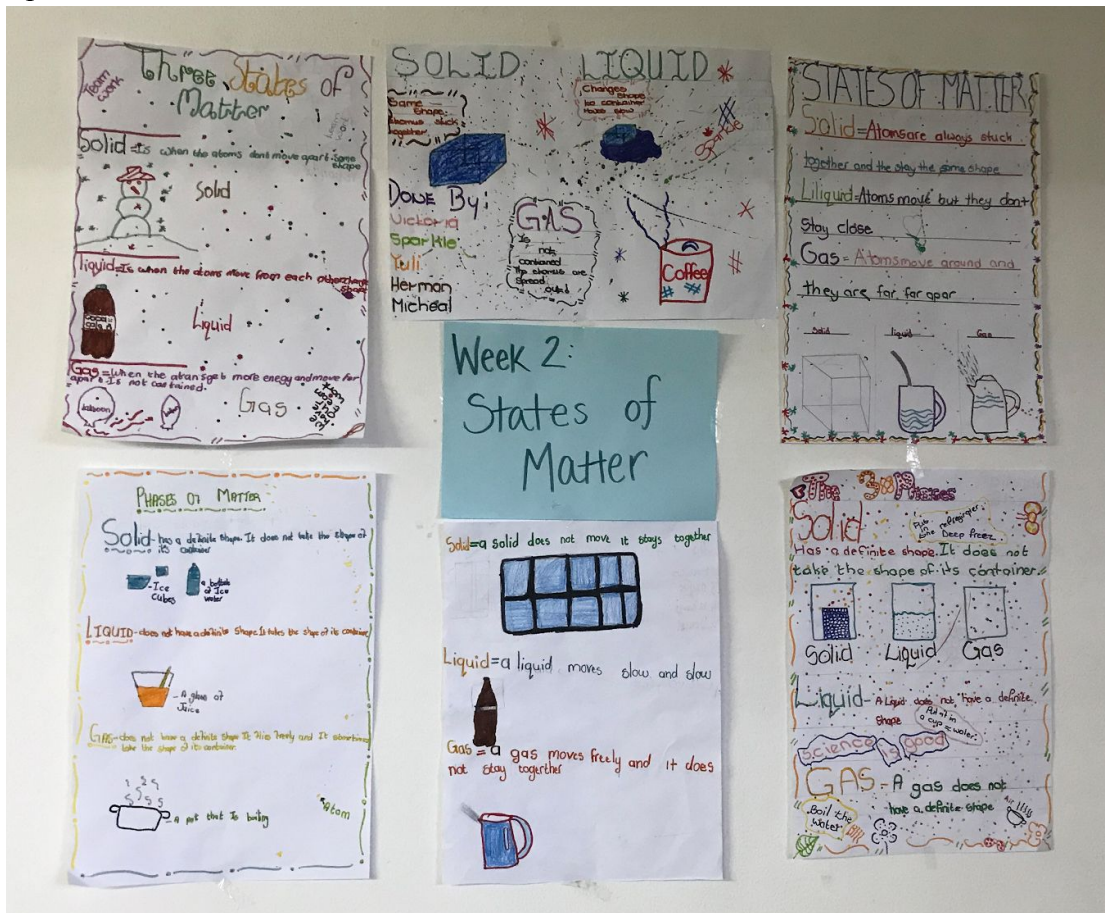
Extra Practice

- Print and cut out pictures of different examples of solids, liquids, and gases. If there is more time, the 5th and 6th graders will be asked to cut out the images in the attached page and sort them into three columns in their notebooks. The columns should be labelled as solid, gas and liquid.
- The 7th graders will be asked to go find a rock outside and follow the displacement method instructions to find the volume of the rock.

Debrief/Recap (5 mins): Matter Posters

Have the students make posters in teams that include the three phases of matter and one example of each. Here are examples of the posters that the learners made.

Examples:



Lesson Plan for Next day: Follow Up Activity for 7th Graders and 5th & 6th Graders based on level of understanding. This can also be done if there is more time.

Sources:

<https://www.ck12.org/chemistry/matter-mass-and-volume/lesson/Matter-Mass-and-Volume-MS-PS/>
<https://www.australiancurriculumlessons.com.au/wp-content/uploads/2013/08/Measuring-Jug-Activity-sheet-2.jpg>

Works Cited (Citations):

Photos in Order of Appearance:

Donphaimueang, P. (2016). Reading Graduated Cylinder [Online image]. Retrieved from

https://commons.wikimedia.org/wiki/File:Graduated_cylinder_illustration.png

Spoon PNG Image [Online image]. Retrieved from <http://pngimg.com/download/3044>

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Mapgrid. (2019). Typical soccer ball [Online image]. Retrieved from <https://en.wikipedia.org/wiki/File:Soccerball.svg#filehistory>

Birkett, J. (2006). Red apple [Online image]. Retrieved from https://commons.wikimedia.org/wiki/File:Red_apple.svg

OpenClipart-Vectors. (2016). Boiling food and cooking kitchen [Online image]. Retrieved from <https://pixabay.com/vectors/boiling-food-and-cooking-kitchen-1300606/>

Clker-Free-Vector-Images. (2014). Gray metal bed [Online image]. Retrieved from <https://pixabay.com/vectors/bed-metal-motel-pillow-gray-hotel-310382/>

OpenStax. (2016). CNX Chem 01 04 CylGold [Online image]. Retrieved from https://commons.wikimedia.org/wiki/File:CNX_Chem_01_04_CylGold.jpg [Modified by cropping out the words on the right hand side]

Extra Practice Worksheet:

Brainard, J. (2019, January 19). Matter, Mass, and Volume. Retrieved from <https://www.ck12.org/chemistry/matter-mass-and-volume/lesson/Matter-Mass-and-Volume-MS-PS/>

Reflections:

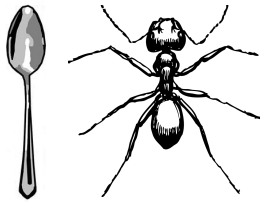
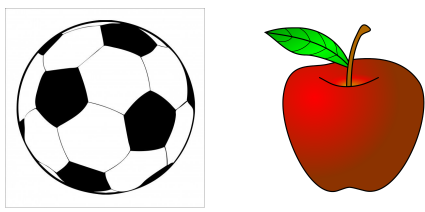

Today's lesson went well. The repetition of the solid, liquid, and gas activity from yesterday was good to do as an energizer because the students already knew how to do the activity. This allowed us to add in an elimination portion and turn it into a fun game. In addition, the guided notes worked well for the students and they were all able to follow along it seemed. The only downside is that we have to print so much extra paper if we have guided note sheets. The activity with the melting ice in the beakers/graduated cylinders also went well. I think it helped that we added food coloring to the ice cubes because the students were able to see the color from the ice cubes diffuse throughout the rest of the water, proving that the ice melted from a solid state to a liquid state. Finally, we made review posters on the states of matter. The students really get into these posters. We found that we shouldn't give out markers until they write definitions of their words on the posters because they get too distracted with markers and take a long time to get the information down. Overall, today's lesson was successful and filled about 1.5 hours.

State and Volume Changes

What is volume?

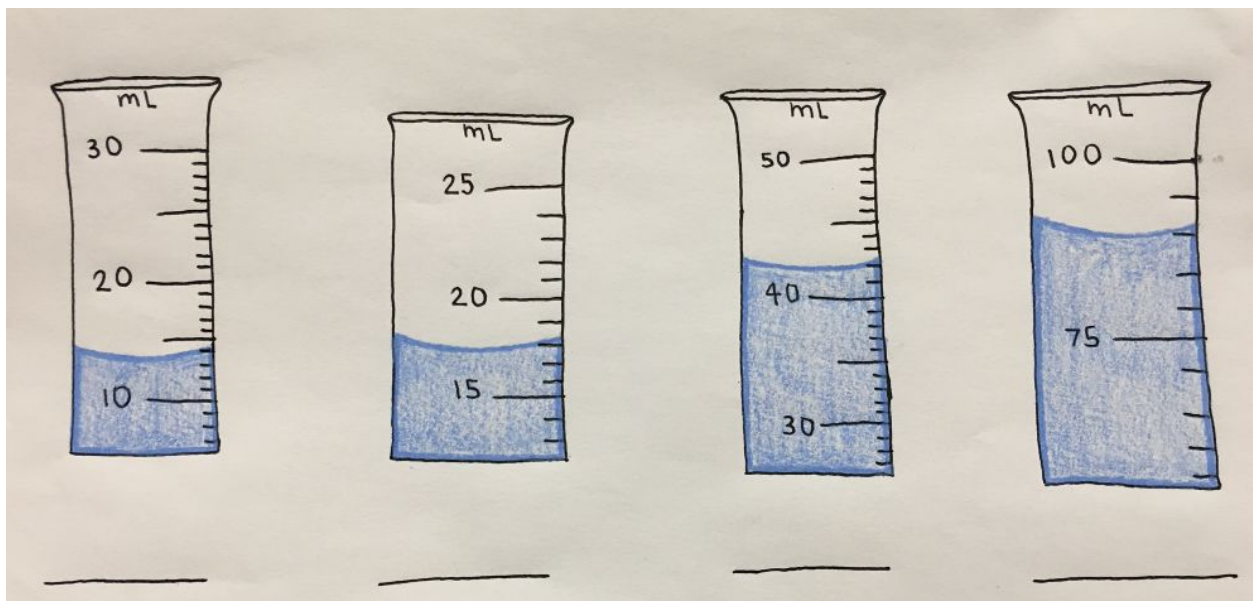
Volume is _____.

Circle the object that has a larger volume.

<p>Spoon or Ant</p> 	<p>Soccer ball or Apple</p> 	<p>Pot or bed</p> 
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How do we measure the volume of water?

Write the volume of water in each graduated cylinder.



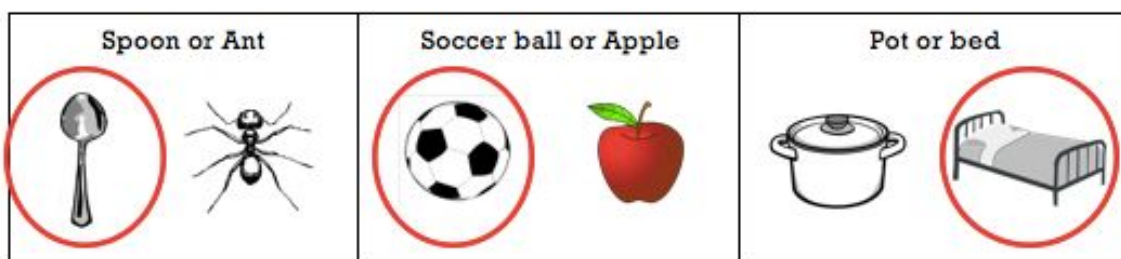
MEMORANDUM

State and Volume Changes

What is volume?

Volume is the amount of space that an object occupies.

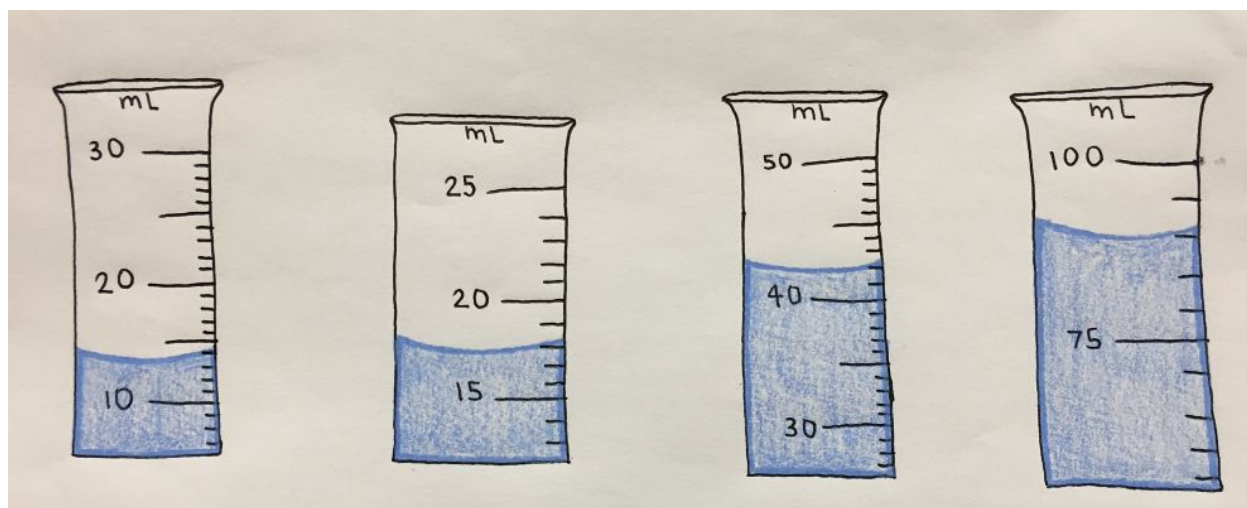
Circle the object that has a larger volume.



How do we measure the volume of liquids?

Volume is measured using beakers and graduated cylinders.

Write the volume of water in each graduated cylinder.



14 mL

18 mL

42 mL

90 mL

State and Volume Changes Activity

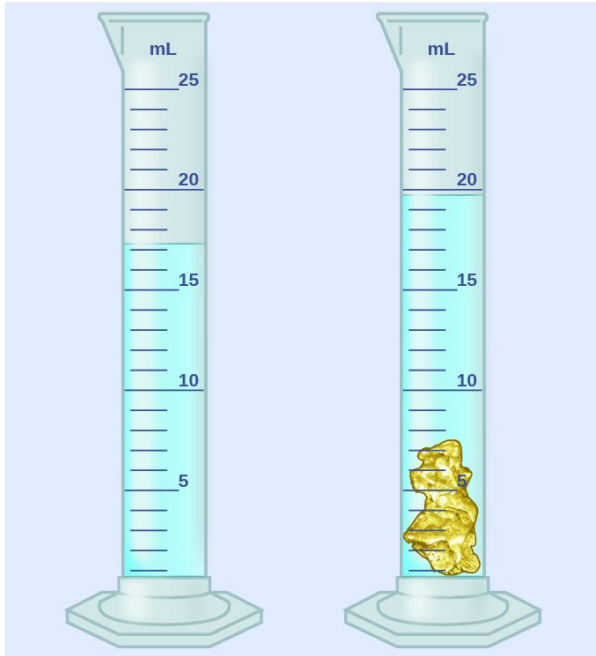
1. Question	2. Research
3. Hypothesis If I add ice cubes to warm water, then the ice cubes will _____. The volume of the water will _____.	
4. Materials <ul style="list-style-type: none">● warm water● graduated cylinder or beaker● ice cubes● thermometer	5. Procedure <ol style="list-style-type: none">1. Measure the volume of the warm water in the beaker or graduated cylinder.2. Use the thermometer to measure the temperature of the water.3. Add the ice cubes to the warm water.4. Observe what is happening to the ice cubes.5. Measure the volume of the water again.
6. Results: What is the volume of the water? _____ (units) What is the temperature of the water? _____ (units) What is happening to the ice? What is the final volume of water? _____ (units) Did the volume change? Why?	
7. Conclusion	

MEMORANDUM

State and Volume Changes Activity

1. Question What will happen to ice cubes when we <u>we</u> put them in warm water? What will happen to the volume of the water?	2. Research <u>Look back at notes from the previous day's lesson. Ask the teacher questions.</u>
3. Hypothesis If I add ice cubes to warm water, then the ice cubes will <u>melt into a liquid.</u> The volume of the water will <u>change or increase.</u>	
4. Materials <ul style="list-style-type: none">• warm water• graduated cylinder or beaker• ice cubes• thermometer	5. Procedure <ol style="list-style-type: none">6. Measure the volume of the warm water.7. Use the thermometer to measure the temperature of the water.8. Add the ice cubes to the warm water.9. Observe what is happening to the ice cubes.10. Measure the final volume of the water.
6. Results What is the volume of the water? <u>Answers will vary mL</u> (units) What is the temperature of the water? <u>Answers will vary mL</u> (units) What is happening to the ice? What is the final volume of water? <u>Answers will vary mL</u> (units) Did the volume change? Why? <u>Yes, the volume of the water changed because the ice changed state from a solid to a liquid. This added more volume to the liquid.</u>	
7. Conclusion <u>The hypothesis was correct or incorrect.</u>	

Displacement Method for Measuring Volume of Objects



1. Add water to a measuring container such as a graduated cylinder. Record the volume of the water.

2. Place the object in the water in the graduated cylinder. Measure the volume of the water with the object in it.

3. Subtract the first volume from the second volume. The difference represents the volume of the object.

What is the initial volume of the water?

What is the volume after you add the rock to the water?

What is the volume of the rock?

If $1 \text{ cm}^3 = 1 \text{ mL}$, what is the volume of the rock in cm^3 ?

Lesson 7: Measurement Conversion Practice



Objectives: Learners will understand common metric measurements of length and be able to convert common measurements of length.

Standards Covering: (Taken from Namibian Syllabi)

Standard 1 Convert units of length, weight, and volume.

Materials: 1 Deck of Cards per Group

Prep-Work: Arrange tables to have large groups with one facilitator per group

Energizer: Have all of the students get up and wiggle their arms, their legs, their head, and then all together. This is a quick activity to get the students moving.

Instruction:

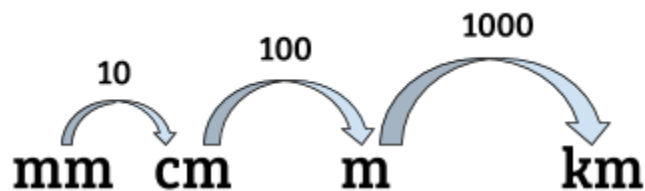
Go over each measurement. Give the following examples of each length:

1 kilometer (km) = about a 12 minute walk

1 meter (m) = the width of the refrigerator or one large step

1 centimeter (cm) = the width of a marker

Draw the following graphic on the chalkboard:



10 millimeters = 1 centimeters

100 centimeters = 1 meter

1000 meters = 1 kilometer

Introduce the prefixes:

Kilo = 1000

Meter = 1

Centi = 0.01

Milli = 0.001

Weight is how heavy something is. It measures how much mass an object has and it's measured in grams and kilograms.

1000 g = 1 kg

A piece of gum weighs 1 g

A 1 L water bottle weighs 1 kg

An elephant weighs 3000 kg - 6000 kg

Volume is the amount of space that a substance or object occupies. It's measured in liters and milliliters.

1000 mL = 1 L

1 mL = 15 drops of water

1 L = a large bottle of water (show one if you can)

Explain how remembering the prefixes will help with conversions. Have students paste the measurement key into their science notebooks **and the prefixes in their notebooks.**

Teach the students the decimal place moving trick for conversion:

Moving the Decimal method

- (i) Convert the unit to the **base unit** – by moving the decimal place right or left. The number of decimal places to move is the number of zeros in the new metric unit.
- (ii) Then from the **base unit**, move the decimal place the correct number of places to get the desired unit.

Example 1: **32 km = ? cm**

Kilo → Base: move decimal place 3 to the left

32 km = 32,000 m

Base → Centi: move decimal place 2 to the left

32,000 m = **3,200,000 cm**

Activity:

1. Practice Worksheets (Varying levels for different learner levels)

2. Let's Convert Card Game

Rules:

- Start by shuffling a complete deck of cards. For this game leave out the Ace, Jack, Queen and King.
- The dealer places the deck face down in the center, then turns over the top card.
- The goal is then to convert the value of the card from centimeters to millimeters.
- The first player to correctly call out the solution wins the card and keeps it. For example, if the card shown is a three, to win the card a player needs to call out, "Three centimeters is equal to 30 millimeters."
- If there's a tie or no one calls the correct answer, the card is buried and discarded (no one keeps it).
- The winner of the round gets to draw the next card. Play continues until the deck is depleted or time is called.
- The player with the most cards wins.

Debrief/Recap: Each team makes a poster of one conversion that they learned. Note: Due to time implications, WPI students could not teach this lesson, but instead have provided it for use at PAY.

Lesson for next day: Game for practicing measurements on the spot. Use the big checkerboard outside for the activity.

Millimeter, Centimeter, and Meter

Instructions:

Have students line up around the perimeter of the room or stand at their desks.

1. Have students start with feet side by side and move one set of toes ahead of the other set of toes to represent millimeter or "small".
2. Have students place one foot in front of the other to represent centimeters or "medium".
3. Have students take one large step forward to represent meter or "large".
4. Call out different measurements:
Example – Move forward 2 centimeters, then 5 millimeters, then 1 yard.
5. Have all students move in the same direction.

Feedback: WPI students did not teach this lesson. It was created for extra practice because we noticed that students struggled with conversion during the measurement lesson.

Sources:

Background Information and Examples: <https://www.mathsisfun.com/measure/metric-length.html>,
https://www.varsitytutors.com/hotmath/hotmath_help/topics/weight-mass
Energizer: http://www.appleschools.ca/files/Energizer_Milli-Centi-Meter.pdf
Practice Worksheet: <https://www.math-salamanders.com/measurement-worksheets.html>
Conversion Trick Form: quarkphysics.ca/phys0/metric.doc

Works Cited (Citations):

Sources in Alphabetical Order:

APPLE Schools. (2019). Energizers: Millimeter, Centimeter, and Meter. Retrieved April 18, 2019, from <http://www.appleschools.ca/energizers>

C. (2010). Math Worksheets Education from the Math Salamanders. Retrieved April 18, 2019, from <https://www.math-salamanders.com/index.html>

DeBeer, Y., & Lake, B. (2017, October 28). Let's Convert: Easy Metric Conversions Game. Retrieved from <https://mathgeekmama.com/metric-conversions-game/>

Elliot, J. (n.d.). *METRIC Conversion*[DOC]. QuarkPhysics.ca. Retrieved 18 Apr 2019 from quarkphysics.ca/phys0/metric.doc

Pierce, Rod. (20 Feb 2018). "Metric Length". Math Is Fun. Retrieved 18 Apr 2019 from <http://www.mathsisfun.com/measure/metric-length.html>

Weight and Mass. (2007). Retrieved April 18, 2019, from https://www.varsitytutors.com/hotmath/hotmath_help/topics/weight-mass

Photos in Order of Appearance:

[Andreas160578](https://pixabay.com/photos/tape-measure-measure-centimeter-1860811/). (2016). Measuring tape [Online image]. Retrieved from <https://pixabay.com/photos/tape-measure-measure-centimeter-1860811/>

Conversion Key

LENGTH

1 centimeter = 10 millimeters (1 cm = 10 mm)

1 meter = 100 centimeters (1 m = 100 cm)

1 kilometer = 1000 meters (1 km = 1000 m)

WEIGHT

1 kilogram = 1000 grams (1 kg = 1000 g)

VOLUME

1 liter = 1000 milliliters (1 L = 1000 mL)

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COVERTING METRIC UNITS – LENGTH SHEET 1

- | | |
|------------------|------------------|
| 1) 1cm = ____ mm | 2) 2cm = ____ mm |
| 3) 3cm = ____ mm | 4) 4cm = ____ mm |
| 5) 1m = ____ cm | 6) 2m = ____ cm |
| 7) 3m = ____ cm | 8) 4m = ____ m |
| 9) 1km = ____ m | 10) 2km = ____ m |
| 11) 3km = ____ m | 12) 4km = ____ m |

Which is the most? Circle the largest amount in each box.

1 m <u>1 km</u> 1 cm	10 m 100 cm 200 mm	100 m 500 cm 1 km	1 m 200 cm 300 mm
----------------------------	--------------------------	-------------------------	-------------------------

Use greater than (>), less than (<) or equals (=) to compare the amounts.

- | | | | | | |
|----------|---|-------|------------|--|--------|
| 1) 1 m | > | 10 cm | 2) 1 km | | 1000 m |
| 3) 20 mm | | 1 cm | 4) 80 cm | | 1 m |
| 5) 200 m | | 1 km | 6) 3cm | | 40 mm |
| 7) 10 mm | | 1 cm | 8) 2 km | | 3000 m |
| 9) 3 m | | 40 cm | 10) 500 cm | | 3 m |

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COVERTING METRIC UNITS – LENGTH SHEET 1 ANSWERS

- | | |
|-------------------------|-------------------------|
| 1) 1cm = <u>10</u> mm | 2) 2cm = <u>20</u> mm |
| 3) 3cm = <u>30</u> mm | 4) 4cm = <u>40</u> mm |
| 5) 1m = <u>100</u> cm | 6) 2m = <u>200</u> cm |
| 7) 3m = <u>300</u> cm | 8) 4m = <u>400</u> m |
| 9) 1km = <u>1000</u> m | 10) 2km = <u>2000</u> m |
| 11) 3km = <u>3000</u> m | 12) 4km = <u>4000</u> m |

Which is the most? Circle the largest amount in each box.

1 m <u>1 km</u> 1 cm	<u>10 m</u> 100 cm 200 mm	100 m 500 cm <u>1 km</u>	1 m <u>200 cm</u> 300 mm
----------------------------	---------------------------------	--------------------------------	--------------------------------

Use greater than (>), less than (<) or equals (=) to compare the amounts.

- | | | | | | |
|----------|---|-------|------------|---|--------|
| 1) 1 m | > | 10 cm | 2) 1 km | = | 1000 m |
| 3) 20 mm | > | 1 cm | 4) 80 cm | < | 1 m |
| 5) 200 m | < | 1 km | 6) 3cm | < | 40 mm |
| 7) 10 mm | = | 1 cm | 8) 2 km | < | 3000 m |
| 9) 3 m | > | 40 cm | 10) 500 cm | > | 3 m |

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COVERTING METRIC UNITS – LENGTH SHEET 2

- | | |
|----------------------|----------------------|
| 1) _____ mm = 1 cm | 2) 1 km = _____ m |
| 3) 1 m = _____ cm | 4) 3 cm = _____ mm |
| 5) 4 km = _____ m | 6) _____ mm = 5 cm |
| 7) _____ cm = 2 m | 8) _____ km = 2000 m |
| 9) 6 m = _____ cm | 10) _____ mm = 8 cm |
| 11) _____ m = 800 cm | 12) 7 m = _____ cm |

Which is the most? Circle the largest amount in each box.

1 m <u>1 km</u> 1 cm	1 km 2000 m 3000 cm	2 m 400 cm 700 mm	5 km 6000 cm 4000 m
----------------------------	---------------------------	-------------------------	---------------------------

Use greater than (>), less than (<) or equals (=) to compare the amounts.

- | | | | | | |
|----------|---|--------|-----------|--|--------|
| 1) 3 km | > | 2000 m | 2) 1000 m | | 1 km |
| 3) 5 cm | | 50 mm | 4) 300 m | | 3 km |
| 5) 7 m | | 500 cm | 6) 6 cm | | 80 mm |
| 7) 30 mm | | 3 cm | 8) 800 cm | | 7 m |
| 9) 40 cm | | 4 m | 10) 5 km | | 4900 m |

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COVERTING METRIC UNITS – LENGTH SHEET 2 ANSWERS

- | | |
|-------------------------|-------------------------|
| 1) <u>10</u> mm = 1 cm | 2) 1 km = <u>1000</u> m |
| 3) 1 m = <u>100</u> cm | 4) 3 cm = <u>30</u> mm |
| 5) 4 km = <u>4000</u> m | 6) <u>50</u> mm = 5 cm |
| 7) <u>200</u> cm = 2 m | 8) <u>2</u> km = 2000 m |
| 9) 6 m = <u>600</u> cm | 10) <u>80</u> mm = 8 cm |
| 11) <u>8</u> m = 800 cm | 12) 7 m = <u>700</u> cm |

Which is the most? Circle the largest amount in each box.

1 m <input checked="" type="radio"/> 1 km 1 cm	1 km <input checked="" type="radio"/> 2000 m 3000 cm	2 m <input checked="" type="radio"/> 400 cm 700 mm	<input checked="" type="radio"/> 5 km 6000 cm 4000 m
--	--	--	--

Use greater than (>), less than (<) or equals (=) to compare the amounts.

- | | | | | | |
|----------|---|--------|-----------|---|--------|
| 1) 3 km | > | 2000 m | 2) 1000 m | = | 1 km |
| 3) 5 cm | = | 50 mm | 4) 300 m | < | 3 km |
| 5) 7 m | > | 500 cm | 6) 6 cm | < | 80 mm |
| 7) 30 mm | = | 3 cm | 8) 800 cm | > | 7 m |
| 9) 40 cm | < | 4 m | 10) 5 km | > | 4900 m |

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COVERTING METRIC UNITS – LENGTH SHEET 3

- | | |
|-----------------------|-------------------------|
| 1) 5 km = _____ m | 2) 600 cm = _____ m |
| 3) 8 cm = _____ mm | 4) _____ km = 4000 m |
| 5) _____ m = 900 cm | 6) 120 mm = _____ cm |
| 7) 7 km = _____ m | 8) 14 cm = _____ mm |
| 9) 12 m = _____ cm | 10) _____ km = 13,000 m |
| 11) _____ cm = 130 mm | 12) 1400 cm = _____ m |

Which is the most? Circle the largest amount in each box.

100 m	3 km	380 cm	9020 m
<u>1 km</u>	2850 m	4000 mm	20,000 cm
1000 cm	5000 cm	3 m	9 km

Use greater than (>), less than (<) or equals (=) to compare the amounts.

- | | | | | | |
|-----------|---|--------|------------|--|--------|
| 1) 1200 m | > | 1 km | 2) 620 cm | | 7 m |
| 3) 8m | | 750 cm | 4) 82 mm | | 7 cm |
| 5) 45 mm | | 5 cm | 6) 1300 cm | | 13 m |
| 7) 900 m | | 9 km | 8) 3 ½ km | | 3080 m |
| 9) 12 cm | | 120 mm | 10) 425 cm | | 4 ½ m |

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COVERTING METRIC UNITS – LENGTH SHEET 3 ANSWERS

- | | |
|---------------------------|-----------------------------|
| 1) 5 km = <u>5000</u> m | 2) 600 cm = <u>6</u> m |
| 3) 8 cm = <u>80</u> mm | 4) <u>4</u> km = 4000 m |
| 5) <u>9</u> m = 900 cm | 6) 120 mm = <u>12</u> cm |
| 7) 7 km = <u>7000</u> m | 8) 14 cm = <u>140</u> mm |
| 9) 12 m = <u>1200</u> cm | 10) <u>13</u> km = 13,000 m |
| 11) <u>13</u> cm = 130 mm | 12) 1400 cm = <u>14</u> m |

Which is the most? Circle the largest amount in each box.

100 m <u>1 km</u> 1000 cm	<u>3 km</u> 2850 m 5000 cm	380 cm <u>4000 mm</u> 3 m	<u>9020 m</u> 20,000 cm 9 km
---------------------------------	----------------------------------	---------------------------------	------------------------------------

Use greater than (>), less than (<) or equals (=) to compare the amounts.

- | | | | | | |
|-----------|---|--------|------------|---|--------|
| 1) 1200 m | > | 1 km | 2) 620 cm | < | 7 m |
| 3) 8m | > | 750 cm | 4) 82 mm | > | 7 cm |
| 5) 45 mm | < | 5 cm | 6) 1300 cm | = | 13 m |
| 7) 900 m | < | 9 km | 8) 3 ½ km | > | 3080 m |
| 9) 12 cm | = | 120 mm | 10) 425 cm | < | 4 ½ m |

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COVERTING METRIC UNITS – WEIGHT & VOLUME 1

- | | |
|--------------------|--------------------|
| 1) 1 kg = _____ g | 2) 2kg = _____ g |
| 3) 3kg = _____ g | 4) 4kg = _____ g |
| 5) 5kg = _____ g | 6) 6kg = _____ g |
| 7) 1 L = _____ mL | 8) 2 L = _____ mL |
| 9) 3 L = _____ mL | 10) 4 L = _____ mL |
| 11) 5 L = _____ mL | 12) 6 L = _____ mL |

Which is the most? Circle the largest amount in each box.

<p>1 kg</p> <p>100 g</p> <p>500 g</p>	<p>2 L</p> <p>1950 mL</p> <p>2100 mL</p>	<p>600 g</p> <p>4 kg</p> <p>3500 g</p>	<p>3L</p> <p>3090 mL</p> <p>3200 mL</p>
---------------------------------------	--	--	---

Use greater than (>), less than (<) or equals (=) to compare the amounts.

- | | | | | | |
|-----------|---|--------|------------|--|---------|
| 1) 1 L | > | 50 mL | 2) 1000 mL | | 1 L |
| 3) 2 kg | | 1500 g | 4) 4000 g | | 3 kg |
| 5) 700 mL | | 1 L | 6) 1400 mL | | 1 L |
| 7) 2000 g | | 2 kg | 8) 3 L | | 2700 mL |
| 9) 5 kg | | 4500 g | 10) 3200 g | | 3 kg |

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COVERTING METRIC UNITS – WEIGHT & VOLUME SHEET 1 ANSWERS

- | | |
|---------------------------|--------------------------|
| 1) 1 kg = <u>1000</u> g | 2) 2kg = <u>2000</u> g |
| 3) 3kg = <u>3000</u> g | 4) 4kg = <u>4000</u> g |
| 5) 5kg = <u>5000</u> g | 6) 6kg = <u>6000</u> g |
| 7) 1 L = = <u>1000</u> mL | 8) 2 L = <u>2000</u> mL |
| 9) 3 L = <u>3000</u> mL | 10) 4 L = <u>4000</u> mL |
| 11) 5 L = <u>5000</u> mL | 12) 6 L = <u>6000</u> mL |

Which is the most? Circle the largest amount in each box.

<u>1 kg</u> 100 g 500 g	2 L 1950 mL <u>2100 mL</u>	600 g <u>4 kg</u> 3500 g	3L 3090 mL <u>3200 mL</u>
-------------------------------	----------------------------------	--------------------------------	---------------------------------

Use greater than (>), less than (<) or equals (=) to compare the amounts.

- | | | | | | |
|-----------|---|--------|------------|---|---------|
| 1) 1 L | > | 50 mL | 2) 1000 mL | = | 1 L |
| 3) 2 kg | > | 1500 g | 4) 4000 g | > | 3 kg |
| 5) 700 mL | < | 1 L | 6) 1400 mL | > | 1 L |
| 7) 2000 g | = | 2 kg | 8) 3 L | < | 2700 mL |
| 9) 5 kg | > | 4500 g | 10) 3200 g | > | 3 kg |

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CONVERTING METRIC UNITS – WEIGHT & VOLUME 2

- | | |
|-------------------------|-------------------------|
| 1) 2 kg = _____ g | 2) 3 L = _____ mL |
| 3) _____ kg = 4,000 g | 4) _____ L = 6,000 mL |
| 5) 5 L = _____ mL | 6) _____ g = 8 kg |
| 7) _____ mL = 9 L | 8) 1 ½ kg = _____ g |
| 9) ½ L = _____ mL | 10) 12,000 g = _____ kg |
| 11) _____ kg = 15,000 g | 12) 1 ½ L = _____ mL |

Which is the most? Circle the largest amount in each box.

1 kg	4 L	2700 g	5200 mL
100 g	3260 mL	3 kg	5 L
500 g	800 mL	3020 g	5090 mL

Use greater than (>), less than (<) or equals (=) to compare the amounts.

- | | | | | | |
|-------------|---|--------|-------------|--|-------|
| 1) 1 L | > | 500 mL | 2) 3 kg | | 800 g |
| 3) 5,000 mL | | 5 L | 4) 1,450 mL | | 2 L |
| 5) 9,200 g | | 10kg | 6) ½ kg | | 280 g |
| 7) 7 kg | | 7290 g | 8) 1200 g | | 12 kg |
| 9) 9 kg | | 9000 g | 10) ½ L | | 65 mL |

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COVERTING METRIC UNITS – WEIGHT & VOLUME SHEET 2 ANSWERS

- | | |
|-----------------------------|-----------------------------|
| 1) 2 kg = <u>2,000</u> g | 2) 3 L = <u>3,000</u> mL |
| 3) <u>4</u> kg = 4,000 g | 4) <u>6</u> L = 6,000 mL |
| 5) 5 L = <u>5,000</u> mL | 6) <u>8,000</u> g = 8 kg |
| 7) <u>9,000</u> mL = 9 L | 8) 1 ½ kg = <u>1,500</u> g |
| 9) ½ L = <u>500</u> mL | 10) 12,000 g = <u>12</u> kg |
| 11) <u>15</u> kg = 15,000 g | 12) 1 ½ L = <u>1,500</u> mL |

Which is the most? Circle the largest amount in each box.

<div style="border: 1px solid black; border-radius: 50%; width: 40px; height: 20px; margin: 0 auto; display: flex; align-items: center; justify-content: center;">1 kg</div> 100 g 500 g	<div style="border: 1px solid red; border-radius: 50%; width: 40px; height: 20px; margin: 0 auto; display: flex; align-items: center; justify-content: center;">4 L</div> 3260 mL 800 mL	2700 g 3 kg <div style="border: 1px solid red; border-radius: 50%; width: 40px; height: 20px; margin: 0 auto; display: flex; align-items: center; justify-content: center;">3020 g</div>	<div style="border: 1px solid red; border-radius: 50%; width: 40px; height: 20px; margin: 0 auto; display: flex; align-items: center; justify-content: center;">5200 mL</div> 5 L 5090 mL
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Use greater than (>), less than (<) or equals (=) to compare the amounts.

- | | | | | | |
|-------------|---|--------|-------------|---|-------|
| 1) 1 L | > | 500 mL | 2) 3 kg | > | 800 g |
| 3) 5,000 mL | = | 5 L | 4) 1,450 mL | < | 2 L |
| 5) 9,200 g | < | 10kg | 6) ½ kg | > | 280 g |
| 7) 7 kg | < | 7290 g | 8) 1200 g | < | 12 kg |
| 9) 9 kg | = | 9000 g | 10) ½ L | > | 65 mL |

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COVERTING METRIC UNITS – WEIGHT & VOLUME 3

- | | |
|--------------------------------|--------------------------------|
| 1) 7,000 g = _____ kg | 2) 4 L = _____ mL |
| 3) 12 kg = _____ g | 4) 8,000 mL = _____ L |
| 5) $\frac{1}{2}$ L = _____ mL | 6) $2\frac{1}{2}$ kg = _____ g |
| 7) _____ L = 14,000 mL | 8) $6\frac{1}{2}$ kg = _____ g |
| 9) $8\frac{1}{2}$ L = _____ mL | 10) _____ kg = 22,000 g |
| 11) 18,000 mL = _____ L | 12) $\frac{1}{4}$ kg = _____ g |

Which is the most? Circle the largest amount in each box.

1 kg	$3\frac{1}{2}$ L	12 kg	7,505 mL
100 g	3,200 mL	12,050 g	$7\frac{1}{2}$ L
500 g	3,090 mL	12,500 g	7,280 mL

Use greater than (>), less than (<) or equals (=) to compare the amounts.

- | | | | | | |
|----------------------|---|-------------------|-------------|---|------------------|
| 1) $2\frac{1}{2}$ kg | > | 2,100 g | 2) 3 L | > | 2,890 mL |
| 3) 8 kg | > | 7,960 g | 4) 2,500 mL | > | $2\frac{1}{2}$ L |
| 5) $7\frac{1}{2}$ L | > | 7,250 mL | 6) 12,500 g | > | 13 kg |
| 7) 3,500 g | > | $3\frac{1}{2}$ kg | 8) 6 L | > | 900 mL |
| 9) $7\frac{1}{2}$ L | > | 7,960 mL | 10) 500 g | > | $\frac{1}{2}$ kg |

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COVERTING METRIC UNITS – WEIGHT & VOLUME SHEET 3 ANSWERS

- | | |
|---------------------------------------|---------------------------------------|
| 1) 7,000 g = <u>7</u> kg | 2) 4 L = <u>4,000</u> mL |
| 3) 12 kg = <u>12,000</u> g | 4) 8,000 mL = <u>8</u> L |
| 5) $\frac{1}{2}$ L = <u>500</u> mL | 6) 2 $\frac{1}{2}$ kg = <u>2500</u> g |
| 7) <u>14</u> L = 14,000 mL | 8) 6 $\frac{1}{2}$ kg = <u>6500</u> g |
| 9) 8 $\frac{1}{2}$ L = <u>8500</u> mL | 10) <u>22</u> kg = 22,000 g |
| 11) 18,000 mL = <u>18</u> L | 12) $\frac{1}{4}$ kg = <u>250</u> g |

Which is the most? Circle the largest amount in each box.

<u>1 kg</u> 100 g 500 g	<u>3 $\frac{1}{2}$ L</u> 3,200 mL 3,090 mL	12 kg 12,050 g <u>12,500 g</u>	7,505 mL 7 $\frac{1}{2}$ L <u>7,280 mL</u>
-------------------------------	---	--------------------------------------	--

Use greater than (>), less than (<) or equals (=) to compare the amounts.

- | | | | | | |
|-----------------------|---|--------------------|-------------|---|-------------------|
| 1) 2 $\frac{1}{2}$ kg | > | 2,100 g | 2) 3 L | > | 2,890 mL |
| 3) 8 kg | > | 7,960 g | 4) 2,500 mL | = | 2 $\frac{1}{2}$ L |
| 5) 7 $\frac{1}{2}$ L | > | 7,250 mL | 6) 12,500 g | < | 13 kg |
| 7) 3,500 g | = | 3 $\frac{1}{2}$ kg | 8) 6 L | > | 900 mL |
| 9) 7 $\frac{1}{2}$ L | < | 7,960 mL | 10) 500 g | = | $\frac{1}{2}$ kg |

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COVERTING METRIC UNITS - LENGTH WEIGHT & VOLUME 2

- 1) 3 km = _____ m 2) 2 cm = _____ mm
3) 4000 g = _____ kg 4) 300 cm = _____ m
5) _____ L = 3000 mL 6) _____ g = 3 kg
7) 8 L = _____ mL 8) _____ mm = 10 cm
9) 5 m = _____ cm 10) _____ m = 6 km

Which is the most? Circle the largest amount in each box.

1 kg <u>1300 g</u> 950 g	3 km 500 m 3040 m	7090 g 7200 g 7 kg	3 L 2300 mL 1950 mL
--------------------------------	-------------------------	--------------------------	---------------------------

Use greater than (>), less than (<) or equals (=) to compare the amounts.

- | | | | | | |
|------------|---|--------|-----------|--|--------|
| 1) 1 L | > | 590 mL | 2) 50 mm | | 6 cm |
| 3) 3000 g | | 2 kg | 4) 800 cm | | 8 m |
| 5) 960 mL | | 1 L | 6) 4200 g | | 5 kg |
| 7) 65 mm | | 6 cm | 8) 7 L | | 860 mL |
| 9) 2 km | | 320 cm | 10) ½ km | | 460 m |
| 11) 6000 g | | 6 kg | 12) 7 cm | | 700 mm |

MEMORANDUM

Name

Date



COVERTING METRIC UNITS – LENGTH WEIGHT & VOLUME 2 SHEET 2 ANSWERS

- | | |
|--------------------------|---------------------------|
| 1) 3 km = <u>3,000</u> m | 2) 2 cm = <u>20</u> mm |
| 3) 4000 g = <u>4</u> kg | 4) 300 cm = <u>3</u> m |
| 5) <u>3</u> L = 3000 mL | 6) <u>3,000</u> g = 3 kg |
| 7) 8 L = <u>8,000</u> mL | 8) <u>100</u> mm = 10 cm |
| 9) 5 m = <u>500</u> cm | 10) <u>6,000</u> m = 6 km |

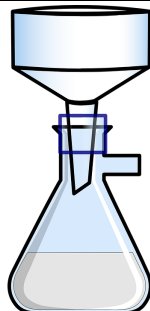
Which is the most? Circle the largest amount in each box.

1 kg <input type="text" value="1300 g"/> 950 g	3 km 500 m <input type="text" value="3040 m"/>	7090 g <input type="text" value="7200 g"/> 7 kg	<input type="text" value="3 L"/> 2300 mL 1950 mL
--	--	---	--

Use greater than (>), less than (<) or equals (=) to compare the amounts.

- | | | | | | |
|------------|---|--------|-----------|---|--------|
| 1) 1 L | > | 590 mL | 2) 50 mm | < | 6 cm |
| 3) 3000 g | > | 2 kg | 4) 800 cm | = | 8 m |
| 5) 960 mL | < | 1 L | 6) 4200 g | < | 5 kg |
| 7) 65 mm | > | 6 cm | 8) 7 L | > | 860 mL |
| 9) 2 km | > | 320 cm | 10) ½ km | > | 460 m |
| 11) 6000 g | = | 6 kg | 12) 7 cm | < | 700 mm |

Lesson 8: Filtration



Objectives: Learners will be able to use the scientific method to test different filtering materials to determine the best water filter.

Standards Covering: (Taken from Namibian Syllabi)

Standard 1 Know how to separate water, soluble, and insoluble impurities by decanting, filtering, and distilling.

Standard 2 Know how to classify different types of materials and identify and compare properties of materials.

Materials: 15 one-liter plastic bottles, 15 plastics cups, 15 spoons, 15 cotton balls, 15 paper towel sheets, 15 coffee filters, 1 bottle of vinegar, 1 bowl of dirt (collect from outside), bowl of rocks/pebbles/sand

Prep-Work: Gather all materials in front of room so students can take as much as they need/want to create their own wastewater.

Energizer (5 mins): Play Fishy Fishy Cross My Ocean.

Choose 2 players to be “sharks” they stand at one end of the playing area .All the other players are “fish” and they stand at the other side of the playing area . When the 2 sharks call out “FISHY FISHY CROSS MY OCEAN IF YOU ARE WEARING THE COLOR _____ ” all the fish have to run to the opposite end of the playing area without getting tagged by a shark. If you are tagged, then you turn into “seaweed”. They must stand still on the spot that they got tagged, and try to touch other fish as they pass by. If they do, then they too turn into seaweed. The game ends when everyone has been turned into “seaweed” Difficulty: To make it harder, you can have more sharks, or you could make the playing area smaller.

Transition/Instruction (15 mins): Explain that fishy fishy, while fun, is actually the sharks acting as filters. Today will will learn more about filtration! First we must cover key vocabulary.

Key Vocabulary: (*Hand out worksheet face down so students can write their vocabulary here, then turn it over to complete worksheet or have them take notes in their science notebook*)

Soluble - Able to be dissolved (meaning become or cause to become incorporated into a liquid so as to form a solution), especially in water.

Example: Sugar and salt are examples of soluble substances. In the fishy fishy game; those that went through the filter (the sharks) were soluble. They could pass through.

Insoluble - Substance cannot be dissolved or loosened in water.

Example: Oil and sand are examples of insoluble substances in water. In the fishy fishy game; those that weren't called couldn't go through the sharks and were insoluble.

Filter - A device used to remove unwanted material (express the wide variety and uses - example: strainers are filters when cooking pasta to remove water, ask for other examples) *In the fishy fishy game; the sharks were the filter; letting certain people pass through.*

Funnel - Used for guiding liquid or powder into a small opening (have students draw one in their notes, show the one from class, or simply just roll a piece of paper up).

Activity (35 mins): Testing different filtrations. Students sit with a partner and their science notebook.

Step 1 Create simulated wastewater: Mix water, vinegar, dirt, dust, etc. to create simulated wastewater into a cup.

Step 2 Create filter bottle: Cut each water bottle in half around the point where the bottle begins to taper. Remove the cap and flip the top over so that the cone is pointing into the bottom of the bottle. You may want to use a rubber band to secure the two pieces of the bottle together.

Step 3 Create filter layers using different filter medias: Use 3 of the 4 media types (cotton balls, coffee filters, paper towel etc) to create a filter. Place the filter media in the cone in layers.

Discuss: Which filters do you think will be the most effective? In which order? Every student must write down their hypothesis of what filter works best in their science notebooks.

Step 4 Filter the simulated wastewater: Slowly pour the simulated wastewater into the the bottle through the filter media. This will give the filter media time to filter out waste in your water.

Step 5 Evaluate the effectiveness of your filter: Examine the filtered water following filtration for purity. Make note in science notebook of change in turbidity (murkiness).

An effective filter should cause a significant change in turbidity.

Discuss: What causes the change in turbidity?

Step 6 Repeat with new filter media: After evaluating the effectiveness of the filter, remove the soiled filter from the bottle and start again. Keep in mind when building the next filter what methods seemed to be effective and what methods seemed to be ineffective previously.

Discuss: Why do you think there is a difference in effectiveness of the two filters? What is left on top of the filter

All students need to write a conclusion (Reject/Accept their hypothesis).

Debrief/Recap (5 mins): The students will learn about the process that goes into filtering water and how to problem solve to make sure that everything that isn't water is removed. They will learn the importance of filtering water and see the challenges presented when doing so. Because of this, they will also be using the same thought of that of an environmental engineer. *Discuss: Why do you think there is a difference in effectiveness of the two filters? What is left on top of the filter? (Insoluble material)* *Discuss the importance of filtering water.* Stress the notion that this is ONE way to filter water or a liquid - there is also distilling and decanting.

Lesson Plan for Next day: Water Cycle

Future Lessons: Water Properties - Test Ph levels, Tensions Properties

Feedback: Due to Independence Day this lesson was not taught by WPI students.

Sources:

Activity Adapted From: <https://www.jpl.nasa.gov/edu/teach/activity/water-filtration-challenge/>
Worksheet: <https://www.tes.com/teaching-resource/filtration-iwb-lesson-and-worksheet-6136388>

Work Cited (Citations):

Sources in Alphabetical Order:

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NASA. Water filtration challenge activity. Retrieved from <https://www.jpl.nasa.gov/edu/teach/activity/water-filtration-challenge/>

Photos in Order of Appearance:

Clker-Free-Vector-Images. (2014). Filtration Image[Online image]. Retrieved from <https://pixabay.com/vectors/chemistry-filter-funnel-conical-307620/>

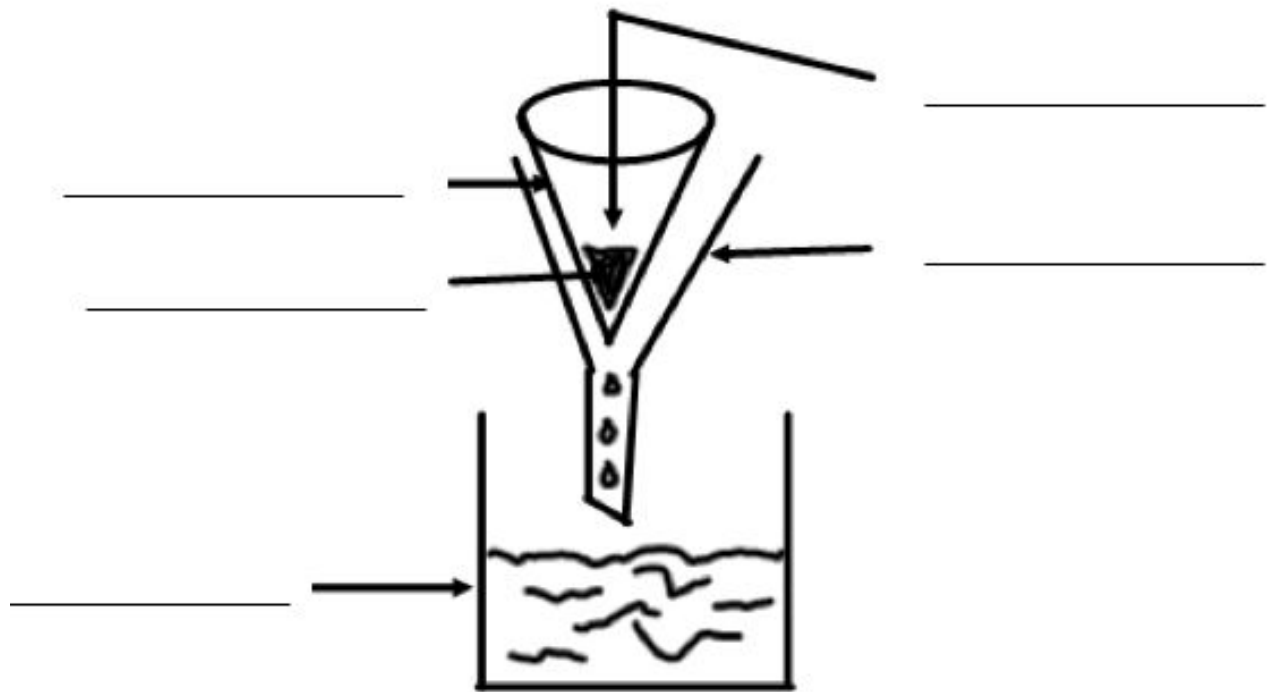
Name: _____

Filtration

When I looked at my mixture of soil and water, I noticed that some of the soil _____ to the bottom and some bits of soil _____ around in the water. Soil does not _____ in water. Soil is _____ in water. We can separate soil from water using _____. If you look at filter paper under a microscope, you can see that it is full of _____. The soil particles are too _____ to pass through the holes in the filter paper.

Word Bank: sank, dissolve, floated, insoluble, filtration, tiny holes, large

Instructions: Fill in the blanks with the word describing where the arrow is pointing



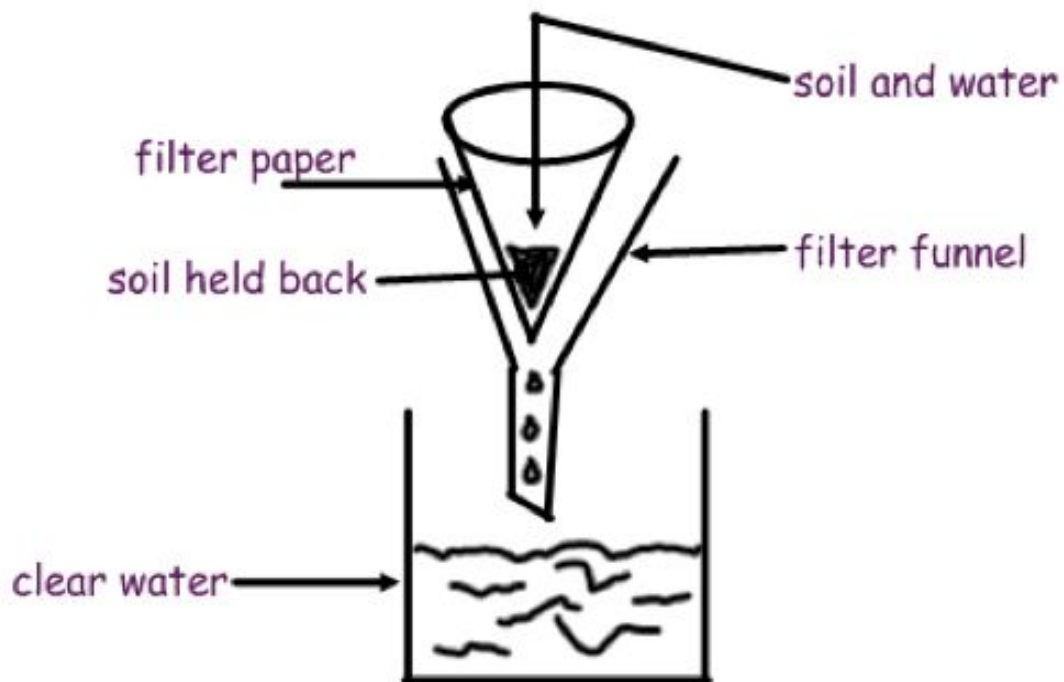
MEMORANDUM

Name: _____

Filtration

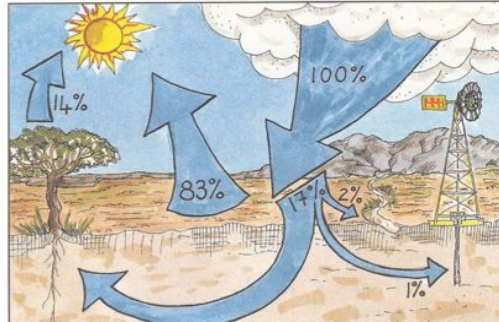
When I looked at my mixture of soil and water, I noticed that some of the soil **SANK** to the bottom and some bits of soil **FLOATED** around in the water. Soil does not **DISSOLVE** in water. Soil is **INSOLUBLE** in water. We can separate soil from water using **FILTRATION**. If you look at filter paper under a microscope, you can see that it is full of **TINY HOLES**. The soil particles are too **LARGE** to pass through the holes in the filter paper.

Word Bank: sank, dissolve, floated, insoluble, filtration, tiny holes, large



Lesson 9: Water Cycle

Hydrological Cycle in Namibia



Objectives: Learners will be able to explain the main stages of the water cycle. Learners will understand and explain that water on Earth moves in a continuous cycle.

Standards Covering: (Taken from Namibian Syllabi)

Standard 1 Describe the location and storage of water in their local environment (rivers, lakes, underground water, ocean, clouds, reservoirs, etc.)

Standard 2 Name the factors (wind and temperature/sun and surface area) which influence evaporation in nature, compare and describe the rate of evaporation of water, in containers holding the same volume of water but with different surface areas.

Standard 3 Investigate one of the factors above (wind, temperature or surface area) in a practical experiment.

Standard 4 Discuss the effects of evaporation on the local water resources (oshanas, dams, and reservoirs).

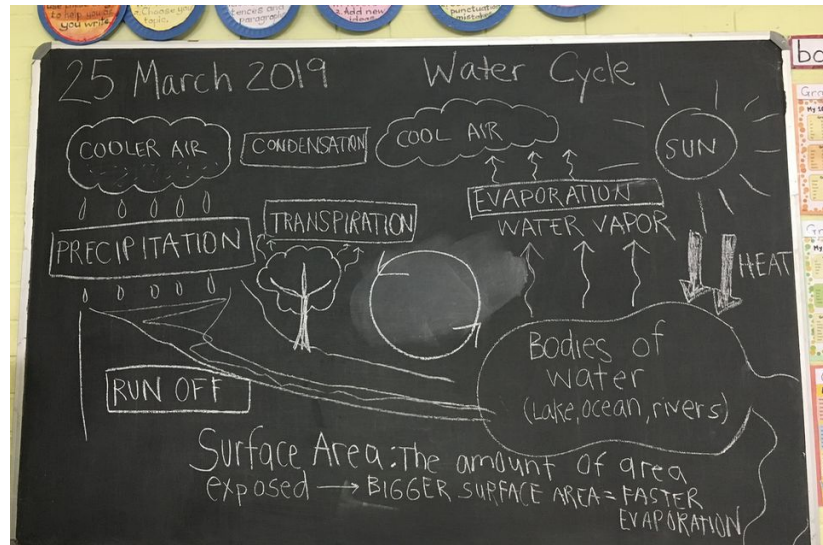
Standard 5 Discuss the roles which heating and cooling play in changing water from one phase to another, explain the way in which water changes from one phase to another in nature and indicate causes of water changing from a:

- solid to a liquid (melting)*
- liquid to a vapour (evaporation)*
- vapour to a liquid (condensation)*
- liquid to a solid (freezing)*

Standard 6 Discuss the importance of clean water (for plants and animals)

Materials: Plastic cups and plastic plates, graduated cylinders and water, printed worksheets

Prep-Work: Draw diagram on the chalkboard



Energizer (5 mins): Have the students stand up and act out the molecular motions of solids, liquids, and gases in the classroom. For solids they all should be standing still, for liquids they should be walking slowly around the room, and for gases they should be buzzing around quickly.

Instruction (40 mins): Speaker notes:

- Did you know that almost all of the water in the world is the same water that has been here since the earth was formed. Water is such an amazing substance. Remember last week how we talked about how it can be a solid (ice), a liquid, or a gas (water vapor). The coolest thing is that water is always moving. It's called the water cycle.
- So let's start with the liquid. Water is in its liquid state in rivers, lakes, oceans. What else?
 - Reservoirs. Underground water. Rivers, dams on ephemeral rivers, oshanas (wetlands/wide deltas that receive flood water)
- And then water turns into water vapor. How does that happen?
 - It's called energy and its in the form of heat.
 - Last week we talked about liquid turning into a gas. When enough heat energy is added to a liquid it turns into a gas.
 - When you put a pot of boiling water on the stove, the heat adds the energy that turn the liquid water into a gas.
- But how does liquid turn into water vapor in the environment? Does anyone know the source of energy?

- The sun! The sun supplies the energy that turns liquid water on the ground into water vapor. That water vapor then goes into the air.
- Does anyone know what that process is called?
 - **Evaporation**.
 - What are the main factors that cause evaporation in the environment? Temperature, wind, and surface area. If you change one of these things, water will evaporate either faster or slower.
- Then, the water vapor spreads out in the air, and eventually it cools down. It becomes colder. When it cools off, it turns back into a liquid.
 - This process is called **condensation**, and this is what causes clouds to form in the sky.
 - It's the opposite of evaporation where water vapor loses energy and becomes a liquid.
- What comes next after condensation? When the clouds accumulate enough water, it starts to rain. Who knows the stage of the water cycle that involves rain?
 - **Precipitation** is the stage when the liquid water falls from the air and returns to the ground. Here in Namibia, you have rain. Back in the US, we have rain and snow. They are both types of precipitation.
- Once it hits the ground, the water collects in rivers, lakes, streams. This is called **runoff**.
- Water also absorbs into the ground and collects as groundwater. We pump this up to the surface and use it as drinking water.
- Then, the cycle starts all over again.
- The water cycle is so important!!!
 - Reason 1: The water cycle cleans the water. No living thing on earth would be able to live without clean water and clean water depends on the water cycle.
 - Reason 2: All living things on the planet need water to survive. The water cycle is the reason why you and I and every living thing is able to live on the planet.

Key Vocabulary:

Evaporation - Energy from the sun causes water to rise into the air and turn to vapor.

Condensation - When water vapor turns back into liquid, and forms clouds in the sky.

Precipitation - When water (which could be rain, snow, hail or sleet) falls from clouds in the sky and returns to the Earth.

Runoff - After precipitation when water collects and flows into lakes and rivers, and gets carried back to the sea.

Transpiration - Water vapor is released from the leaves of plants into the atmosphere.

Activity (35 mins):

1. Experiment

Introduction to Experiment: If I spill water on my shirt *pour water on self* What's going to happen over time? Am I going to stay wet forever? No, the wet spot on my shirt will eventually dry. This is because the water evaporates. Another piece of evidence that evaporation happens is when you hang your clothes out to dry after washing them. If evaporation didn't occur, the clothes would never dry.

- Give every team a cup and a plate. Pour 50 mL of water in each. Show and tell each team how much you're putting in.
- Go back inside and run another activity and come back in 30-45 minutes.
- While inside, teach the students the Water Cycle Song and have them complete the second worksheet. Act out the stages of the water cycle or color in the water cycle on the first note sheet, depending on how much time is left.
- Lead teams back outside to see which one has more water in it.
- Discuss the results and the effects of evaporation on oshanas, reservoirs, and dams.

2. Song to the tune of "She'll be Coming Around the Mountain"

The Water Cycle Song
Water travels in a cycle, yes it does
Water travels in a cycle, yes it does
It goes up as **evaporation**
And forms clouds as **condensation**
Then comes down as **precipitation**
Yes it does!

3. Act Out the Stages (if extra time)

- Recap the main stages of the water cycle and what each of the following words mean: evaporation, condensation, precipitation, runoff
- Explain to the class that they will be acting out the water cycle. Make index cards with Each group should be allocated one stage of the water cycle. Make sure that the other groups don't know what stage it is – you could write each stage on a card and put it in an envelope, so that other groups can't see or hear what has been given to them.
- Each group should then think of actions they could use to represent the stage. Once they have decided on their actions, they should share them with the rest of the class who have to guess what stage of the water cycle the group is representation
- Each group should then teach the action to the rest of the class to create a dramatized water cycle.

Debrief/Recap (5 mins):

Go over transitions between phases

Debrief how the rate of evaporation changed with different surface areas

Recap the 2 reasons why the water cycle is so important

1. Cleans water
2. Replenishes water for living things to use. Ask what would happen if water only evaporated and did not condense or precipitate.

Lesson Plan for Next Day: Environments and how they are affected by water

Future Lessons: Ecosystems continued

Sources:

Song: <https://www.teacherspayteachers.com/Product/The-Water-Cycle-Song-Handout--225367>

Works Cited (Citations):

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Maharajh, J. (2012). *The Water Cycle Song*[PDF]. [Http://:kinderverse.blogspot.com/](http://kinderverse.blogspot.com/).

Shellenberg, S. (2015, September 21). The Earth's Water Cycle | Lesson Plan | Education.com | Lesson plan. Retrieved from

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Shivute, V. P. (2011, July 21). *NAMWATER: Building Relations With Customers*[PPT]. NAMWATER. Retrieved from

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The Water Cycle Lesson Plan[PDF]. (n.d.). Water Aid. Retrieved from

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[file:///var/folders/k4/pmcz4x795kx776_0hc46qx9w0000gn/T/com.apple.Preview/com.apple.Preview.PasteboardItems/The](file:///var/folders/k4/pmcz4x795kx776_0hc46qx9w0000gn/T/com.apple.Preview/com.apple.Preview.PasteboardItems/The%20Water%20Cycle%20Quiz%20Answers%20(dragged).pdf)

[Water Cycle Quiz Answers \(dragged\).pdf](file:///var/folders/k4/pmcz4x795kx776_0hc46qx9w0000gn/T/com.apple.Preview/com.apple.Preview.PasteboardItems/The%20Water%20Cycle%20Quiz%20Answers%20(dragged).pdf)

Photos in Order of Appearance:

NAMWATER. (2011, September 21). Hydrological Cycle in Namibia [Digital image]. Retrieved from

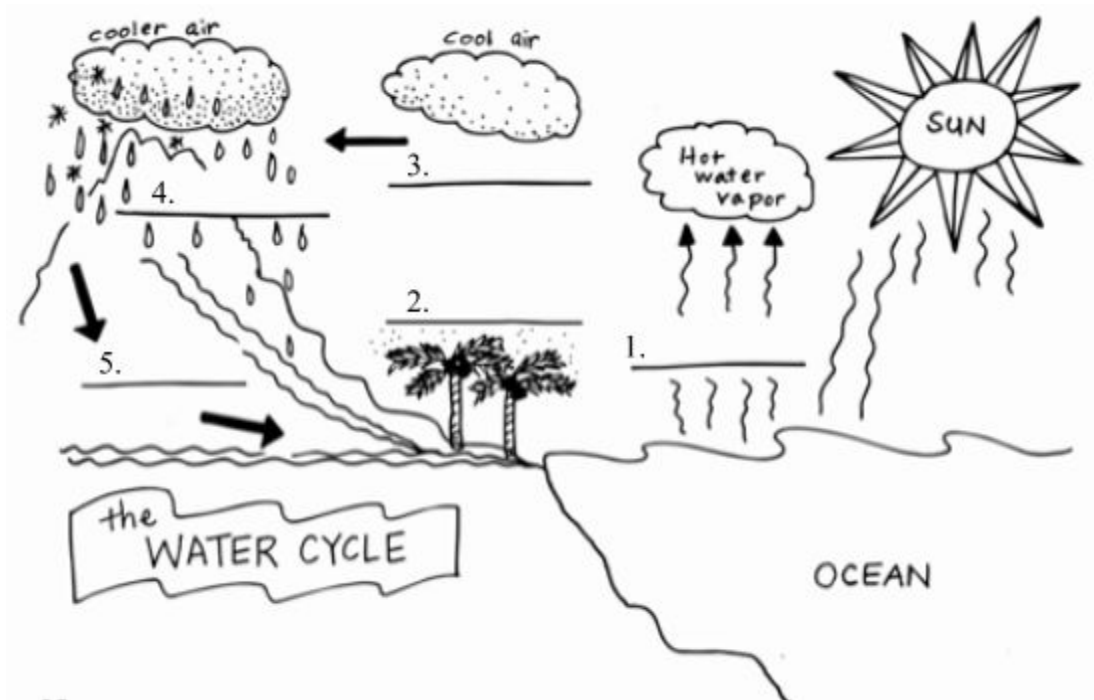
[https://slideplayer.com/slide/1600681/5/images/7/WATER SUPPLY IN NAMIBIA Hydrological Cycle in Namibia.jpg](https://slideplayer.com/slide/1600681/5/images/7/WATER%20SUPPLY%20IN%20NAMIBIA%20Hydrological%20Cycle%20in%20Namibia.jpg)

Feedback: The lecture segment was too long and we lost some of the attention of the students. In order to combat this, the students should be asked to come up with a movement for each vocab word after it has been introduced and then to stand up and do that movement. This would increase the activity during the lecture and hopefully keep more students engaged. Then the students could put all the movements together at the end for the drama, but the drama should be mixed in with the lecture and not its own separate activity.

Again, most of the 7th grade students knew the water cycle while the 6th and 5th graders did not know it. This is the biggest challenge that we encounter on a day-to-day basis. It's hard to challenge the 7th graders while still accommodating the 5th graders.

The surface area evaporation experiment did not happen today because it started raining as soon as we began our lesson, so it wouldn't have worked. Flexibility is key in these instances because you have to be able to adjust the lesson to fill the time. For this reason, it's really helpful to have an extra activity planned or just a filler activity in mind so that you can use it if the original plans don't work. When I introduced the idea of surface area during the instruction segment, most were confused by the concept. If the experiment is to be conducted in the future, more time should be spent to fill in the gaps on what surface area is.

The song was a big hit and the students really enjoyed singing it. It was simple enough for all of the students to learn, and the challenging part was pronouncing the words evaporation, condensation, and precipitation during the song. We also added body movements after the students got the words down, which they all really liked. Finally, we asked some students who thought they had it down to come up to the front of the class to perform, which they enjoyed a lot.



1. Evaporation: _____.

The factors that affect how fast water evaporates are

_____, _____, and _____.

2. Transpiration: _____.

3. Condensation: _____.

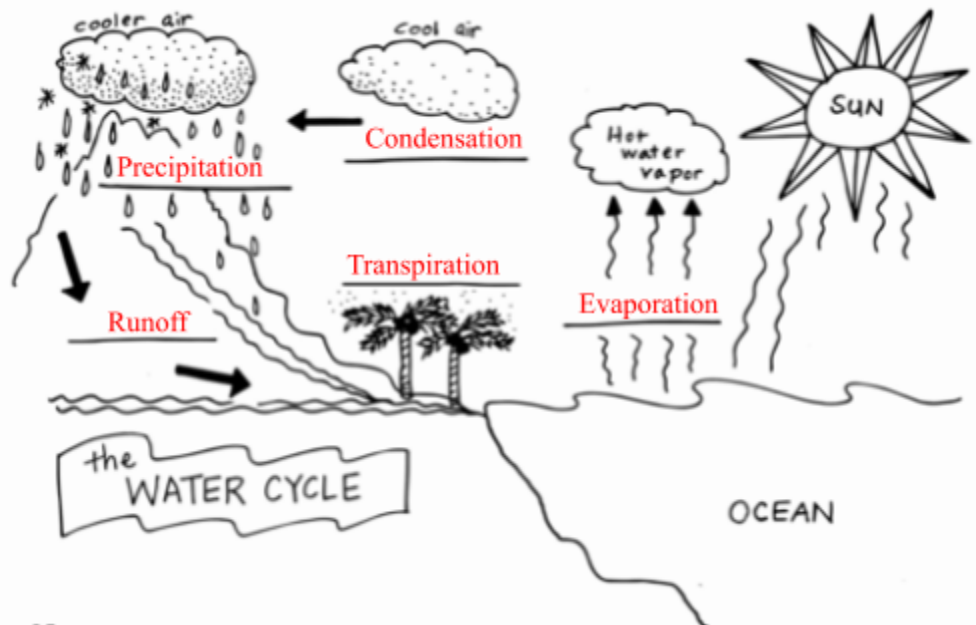
4. Precipitation: _____.

5. Runoff: _____.



Water moves continuously through evaporation, condensation, and precipitation as _____ is added or taken away.

MEMORANDUM



1. Evaporation: when the sun heats up water and turns it into vapor, which rises into the air.

The factors that affect how fast water evaporates are **temperature**, **surface area** and **wind**.

2. Transpiration: water vapor is released from the leaves of plants into the atmosphere.

3. Condensation: when water vapor cools down and turns back into liquid. It forms clouds in the sky.

4. Precipitation: is when water (which could be rain, snow, hail or sleet) falls from clouds in the sky and returns to the Earth.

5. Runoff: happens after precipitation when water collects and flows into lakes and rivers, and gets carried back to the sea.



Water moves continuously through evaporation, condensation, and precipitation as **heat** is added or taken away.

The Water Cycle Song

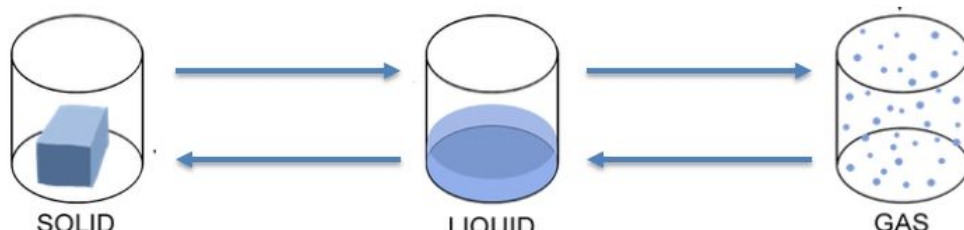
Water travels in a cycle, yes it does
Water travels in a cycle, yes it does

It goes up as **evaporation**
And forms clouds as **condensation**
Then comes down as **precipitation**
Yes it does!

Circle if the statement is True or False:

When energy from the sun heats up rivers, lakes, and oceans, it turns the water into vapor	True or False
Condensation creates rain.	True or False
Precipitation creates water vapor.	True or False
Runoff is excess water that runs back into rivers and lakes.	True or False
Transpiration comes from animals.	True or False
Without the water cycle, the plants and animals would be able to live on the Earth.	True or False

Label the arrows:



MEMORANDUM

The Water Cycle Song

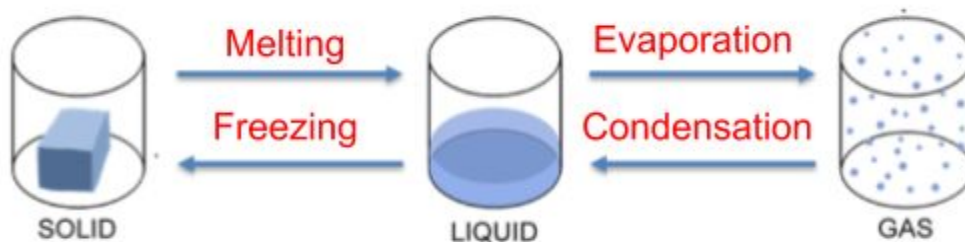
Water travels in a cycle, yes it does
Water travels in a cycle, yes it does

It goes up as **evaporation**
And forms clouds as **condensation**
Then comes down as **precipitation**
Yes it does!

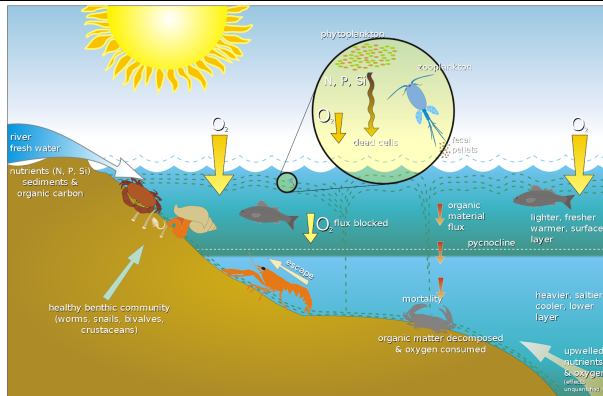
Circle if the statement is True or False:

When energy from the sun heats up rivers, lakes, and oceans, it turns the water into vapor	True or False
Condensation creates rain.	True or False
Precipitations creates water vapor.	True or False
Runoff is excess water that runs back into rivers and lakes.	True or False
Transpiration comes from animals.	True or False
Without the water cycle, the plants and animals would be able to live on the Earth.	True or False

Label the arrows:



Lesson 10: Ecosystems and Biomes



Objectives: Learners will be able to identify living and nonliving things in an ecosystem and distinguish between five biome types.

Standards Covering: (Taken from Namibian Syllabi)

Standard 1: Know different ecosystems and be aware of their importance for human existence; identify the different ecosystems from diagrams, describe characteristics of an ecosystem in terms of living and non-living factor.

Standard 2: Realise the importance of the interrelationship between biotic and abiotic factors in the local environment.

Standard 3: Know how to communicate simple observations.

Standard 4: Know and be familiar with five characteristics of living organisms (growth, feeding, reproduction, movement, and respiration).

Standard 5: List the different ecosystems commonly found in Namibia

Materials: 15 index cards, abiotic and biotic matching cards, pencils, notebooks, worksheets

Prep-Work: Gathering supplies

Energizer (5 mins): Water Cycle Song

Review water cycle song from previous day which can lead into the transition of today's lesson. Stress the fact the water cycle is essential to all living things and can be found in all different locations in the world but at different levels. Which is what we are going to learn today; Ecosystem and Biomes!

Key Vocabulary:

First Set of Vocab on Board:

Living Organisms (Biotic) - Have five characteristics growth, feeding, reproduction, movement and respiration. (further define terms if needed for clarification)

Nonliving Organisms (Abiotic) - Things which cannot grow, move, breathe and reproduce.

Examples: sunlight, temperature, water, air, wind, rocks, and soil

Ecosystem - Are made of abiotic and biotic components that interact with each other.

Second Set of Vocab on Board:

Biome - is a large geographic area with specific abiotic and biotic components.

Climate - Overall weather in an area over a long period of time

Forest - Kind of place most of the vegetation consists of trees

Tundra - Kind of place where it is cold, dry land near top of high mountains

Ocean - Kind of place filled with water, largest biome of them all

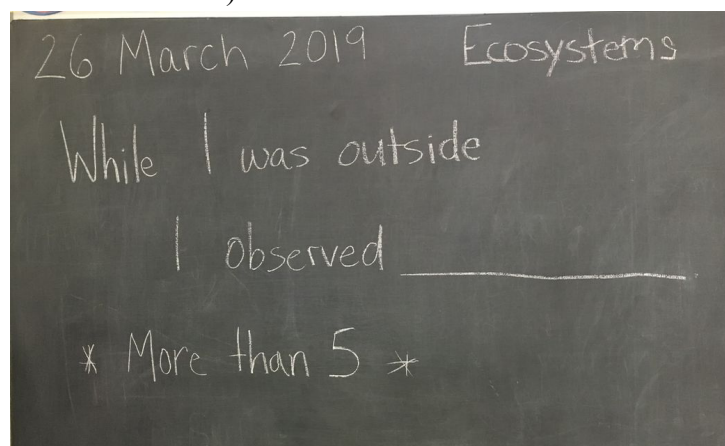
Grassland - Kind of place with large, open and windy places mostly covered by grass

Desert - Kind of place where rain hardly ever falls

Activity (50 mins): There are three parts throughout the vocabulary lecture which I have broken up above to follow.

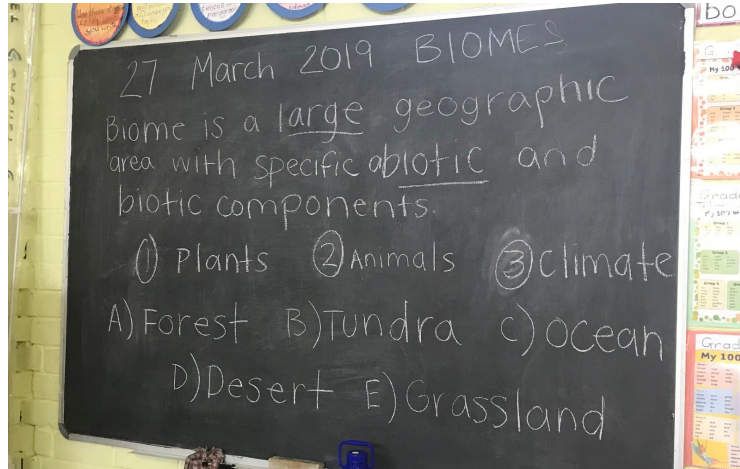
Part I: Distinguishing Non-living from Living Organisms

Go outside and let the students wonder for 7 minutes around the facilities making sure to not go past the gate/wall to the fields. They have to make at least 5 observations in the form of; "While I was outside I observed _____." (Write this on the board so they can copy the sentence starter into their notebooks)



Come back inside and let them share in their groups. Discuss with the class the difference (*get them to determine living vs nonliving*) and then each group is given two index cards one for living and one for nonliving all their facts needs to be written on the correct index card.

Let groups share out loud, when they have come to the terms living and nonliving hand out the Ecosystem Worksheet only. Starting discussing and writing out Part I vocabulary. Let the students write out or draw out examples of each in their chart, let the students label the diagram, and then all together discuss ecosystem.



Give them a minute to relook at their observations that they made outside. Ask several groups to share the types of interactions they observed outside.

Use these sentence frames for sharing: I observed a (biotic component) interacting with a (biotic component). It was _____.

For example: I observed a ladybug interacting with a plant. It was eating the plant. Ask the students to fill in the *Example of Interaction* section of their worksheet.

Part II: Abiotic and Biotic Matching Cards

(Time: 10 mins.) Ecosystems have biotic and abiotic components that interact.

1. Distribute the biotic and abiotic picture cards, one card per student. Tell them that there are picture cards of both abiotic and biotic components. Explain that they will be asked to find another person in the room that “matches” their card. Say, “if you are biotic, then you have to find an abiotic thing that you would depend on and stand next to them. If you are abiotic, hold up your card so the biotic components may find you.”

2. After students have found their partner(s), ask them to share out using the following sentence frame: A _____ depends on _____.

3. Collect cards when done. For our purposes, an ecosystem is an interaction of biotic and abiotic components.

Part III: Discussion

There are many different types of ecosystems in the world can people name some?

A cluster of ecosystems make up a biome. Biomes is a large geographic area with specific abiotic and biotic components. (Students fill out guided worksheet). Different biomes have

different characteristics (biotic: vegetation and animals...abiotic: temperature, rainfall, soil, sunlight, air).

Ask the students to observe and describe the photos of different biomes. Can any one name one? Guide them through the labeling. And then have the students complete the matching on their own or as a group. Depending on how much they are understanding thus far have them finish up the Namibia section on their own/team or you can pull them together as a class.

Debrief/Recap (5 mins): We have learned a lot about Ecosystems and Biomes today! What was your favorite part? What didn't you know before? Tomorrow we have computers and we have put together a little discovering activity for you to learn more about a biome. So I will need everyone to find two people to be in their team of three. Each team should have one student from each level.

Lesson Plan for Next day: Biome Computer Project where each team selects a different biome to research and learn about its climate, animal, and plants.

Future Lessons: Writing letters to students in the United States about their biomes using their research information from the previous day.

Sources:

Vocabulary: Our Earth is Unique by Keith Ruttle (book in P.A.Y.'s library)

Matching Cards: <http://sbsciencematters.com/lesson-units/4th-grade/4life-ecosystems/>

Living and Nonliving Diagram: Victoria Gibbs, 5th Grader Teacher Worcester, MA USA

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Gibbs, Victoria. (2019). Living and Nonliving Diagram [Online Image]. Retrieved in direct email from Miss. Gibbs's curriculum.

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Feedback:

For next year, students will already be able to distinguish between living and nonliving so another activity must be planned to fill the lesson. To make the observations more engaging outside, we suggest making it a competition to see who could make the most observations. The students thrive on competition and will entice students to make more than the minimum and speed up the time of work. The students all had exams this week so we ended the lesson right after completing the ecosystem worksheet so they had 35 minutes to study. We did not get to the matching card game and we did not touch the biome worksheet. Tomorrow we will work on the biome worksheet before starting the biome project.

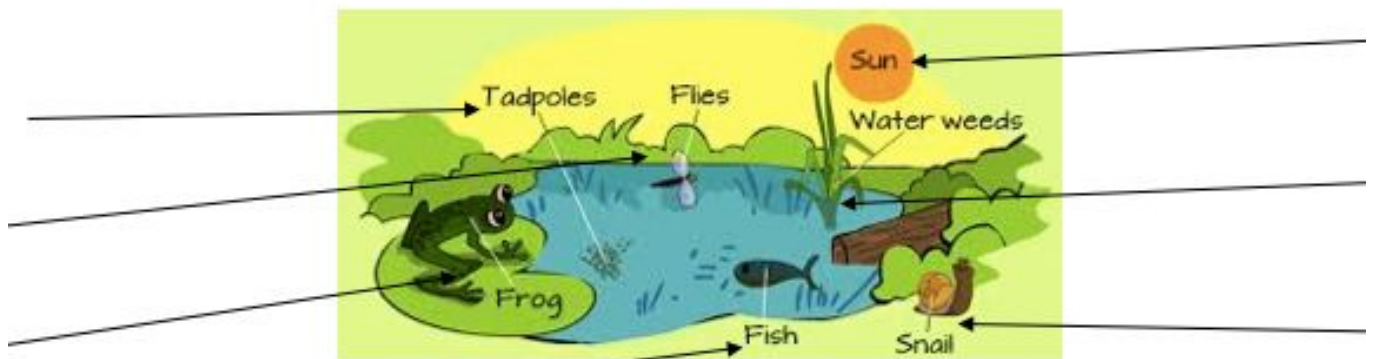
Name _____

Date _____

Ecosystems

Living Organisms	Non-Living Organisms
<ul style="list-style-type: none">• also called _____• things that contain all 5 characteristics: <ol style="list-style-type: none">1. _____2. _____3. _____4. _____5. _____	<ul style="list-style-type: none">• also called _____• things that can _____ grow, feed, reproduce, move and breathe
Examples	Examples

Label the diagram with living and non-living organism.



Ecosystem: are made of abiotic and biotic components that _____ with each other.

Example of interaction: I observed a _____ (biotic or abiotic component)

interacting with a _____ (biotic or abiotic component). It was

_____.

MEMORANDUM

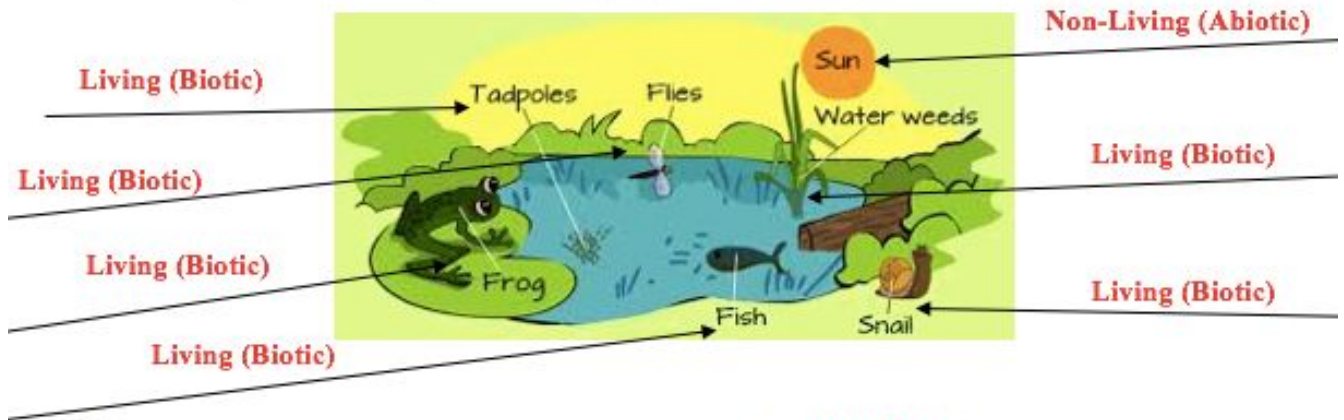
Name _____

Date _____

Ecosystems

Living Organisms	Non-Living Organisms
<ul style="list-style-type: none"> • also called BIOTIC • things that contain all 5 characteristics: 1. GROWTH 2. FEEDING 3. REPRODUCTION 4. MOVEMENT 5. RESPIRATION 	<ul style="list-style-type: none"> • also called ABIOTIC • things that can NOT grow, feed, reproduce, move and breathe
<p>Examples</p> <p><u>People, Snails, Ants, etc.</u></p>	<p>Examples</p> <p><u>Rock, Sun, Air, Wind etc.</u></p>

Label the diagram with living and non-living organism.



Ecosystem: are made of abiotic and biotic components that **INTERACT** with each other.

Example of interaction: I observed an **ANT** (*biotic* or abiotic component) interacting with a

SAND HILL (biotic or *abiotic* component). It was **CLIMBING TO THE TOP**.

Answers for examples will vary

Name _____

Date _____

Biomes

Biome is a _____ geographic area with specific _____ (nonliving) and _____ (living) components. They are defined by their varying characteristics including _____, _____ and _____. There are __ different biomes around the world.

Fill in the name of each biome.

A) _____

B) _____

C) _____



D) _____

E) _____



Match the biome with their correct description by filling in the correct letter.

1. _____ Kind of place with large, open and windy places mostly covered by grass
2. _____ Kind of place most of the vegetation consists of trees
3. _____ Kind of place where rain hardly ever falls
4. _____ Kind of place where it is cold, dry land near top of high mountains
5. _____ Kind of place filled with water, largest biome of them all

Namibia is made up of:

Savanna is the largest biome in Namibia which is an example of _____.

Namib Desert is an example of _____.

Orange River and Walvis Bay are an example of _____.

Name _____

Date _____

Biomes

Biome is a LARGE geographic area with specific ABIOTIC (nonliving) and BIOTIC (living) components. They are defined by their varying characteristics including CLIMATE, ANIMALS and PLANTS. There are 5 different biomes around the world.

Fill in the name of each biome.

A) FOREST

B) TUNDRA

C) OCEAN



D) DESERT

E) GRASSLAND



Match the biome with their correct description by filling in the correct letter.

1. B Kind of place with large, open and windy places mostly covered by grass
2. A Kind of place most of the vegetation consists of trees
3. D Kind of place where rain hardly ever falls
4. B Kind of place where it is cold, dry land near top of high mountains
5. C Kind of place filled with water, largest biome of them all

Namibia is made up of:

Savanna is the largest biome in Namibia which is an example of GRASSLAND.

Namib Desert is an example of DESERT.

Orange River and Walvis Bay are an example of WETLANDS/OCEAN/DESERT/KAROO.

Abiotic-Biotic Cards

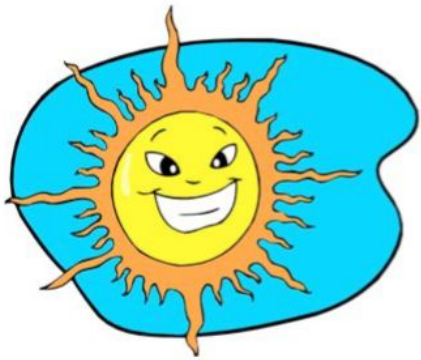
Find a match showing abiotic and biotic connections or biotic and biotic connections.

Each student gets one card

Examples of possible combinations
abiotic → *biotic* or *biotic* → *biotic*

sun, soil → tree
snowflake → arctic seal
sun → fruits
water → fish
rock → lizard
water → dolphin
soil, sun → cactus
wind → bird

arctic seal → fish
swallow → worm
bird → worm
dolphin → fish
lizard → cactus



Sunlight



Trees



Grass



Sunlight



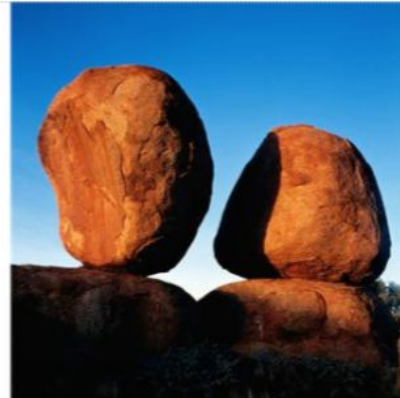
Fruit



Sun



Lizard



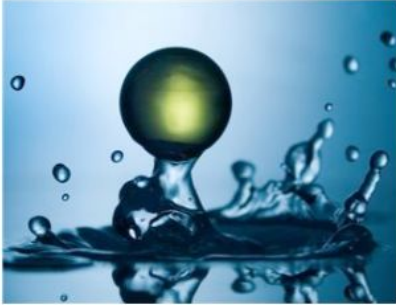
Rock



Fish



Water



Water



Cactus



Dolphin



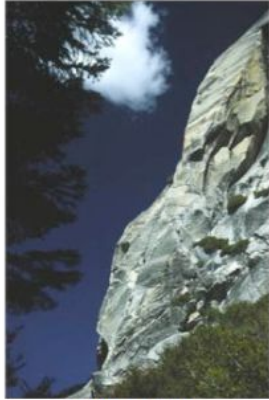
Dirt



Polar Bear



Ice



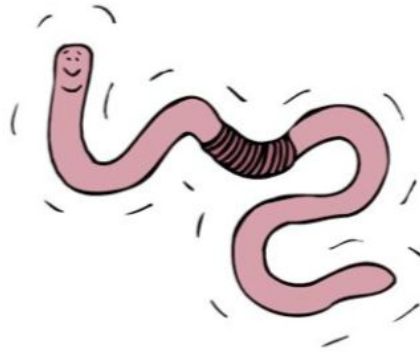
Mountain



Goat



Soil



Worm



Snowflakes



Arctic Seal



Wind



Flower



Swallow



Rain or water



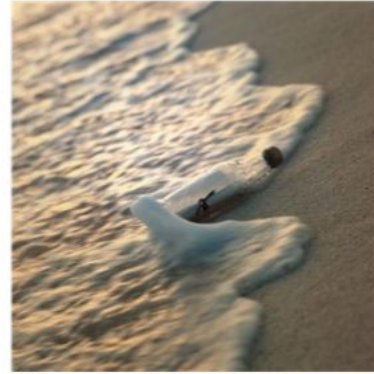
Cactus



rain/water



Crab



Sand



Sun



Fruit



Heron



Water

Lesson 11: Biome Computer Project



Objectives: Learners will be able to describe a biome based on its plants, animals, and climate.

Standards Covering: (Taken from Namibian Syllabi)

Standard 1: Know and be familiar with five characteristics of living organisms (growth, feeding, reproduction, movement, and respiration).

Standard 2: List the different ecosystems commonly found in Namibia.

Materials: Computers, Biome Research Links Worksheet, Biome Computer Worksheet

Prep-Work: Log into all computers and upload the Biome Research Links worksheet so students can start working right away. Tip: Upload Link worksheet to a flash drive so then it is easy to upload to the computer.

Energizer (5 mins):

Brainpop Video: [https://www.brainpop.com/science/ecologyandbehavior/ecosystems/Brainpop video/intro about ecosystems on large projector or laptop](https://www.brainpop.com/science/ecologyandbehavior/ecosystems/Brainpop%20video/intro%20about%20ecosystems%20on%20large%20projector%20or%20laptop). Explain to the class this is a recap from yesterday but pay close attention as there will be questions afterwards. Hand out Brainpop Question Sheet after the video plays. The video is 1 minute 40 seconds so you can replay a second time when they have their questions and might have a few left and need to rewatch to get.

Key Vocabulary:

Biome - Is a large geographic area with specific abiotic and biotic components.

Forest - Kind of place most of the vegetation consists of trees.

Tundra - Kind of place where it is cold, dry land near top of high mountains.

Ocean - Kind of place filled with water, largest biome of them all.

Grassland - Kind of place with large, open and windy places mostly covered by grass.

Desert - Kind of place where rain hardly ever falls.

Activity:**Part I (50 Minutes):**

Gather students into groups of three (pre-determined from the day before when they selected their biome to research). One person from each team will come collect a Biome Computer Worksheet and a pencil. Teacher reads over the instructions to the whole class, while each group follows along on their worksheets and writes their names on the top. Explain to everyone the links are on a word document that is already pulled up on your computer, you just have to find your biome and click. Every time you use a new link everyone switches a role. If there less then three people per team, one person is the time keeper and the computer controller. Ask for questions. Each group then is asked to gather around a computer.

Groups will follow the instructions on the Biome Computer Note Sheet on their own. Teachers can walk around to assist/answer any questions. The goal is to have all note sheets filled out, all links for your biome used and everyone having a turn at each job.

Step 1: As a group, select a biome to research. Each group will research a different biome.

Step 2: With your group, assign roles for each member. Each member of your team must have a role. One person is the time keeper; you have 4 links to use so spend about 10 minutes reading on each. One person is the note taker. One person is the computer controller. You can alternate after each link so everyone has a turn with each role.

Step 3: With your group, research your biome. You may use science books and the provided websites (Biome Research Links Sheet). Record your gathered information below.

Click on the 1st Link to locate where your biome is! Color in the map below as to where your biome is in the world.

Part II (35 Minutes):

Once the group's note sheets are all filled out they can continue to the practice vocabulary with the quizlet vocabulary link - <https://quizlet.com/osgibbs6/folders/pay>

Debrief/Recap (5 mins): Ask each group to “sell” their biome to us; why should we come to their biome? What makes it really unique? *Stress the fact biomes are a KIND of place with variations of climate, plants and animals.*

Lesson Plan for Next day: Writing letters to students in the United States about their biomes using their research information from the previous day.

Future Lessons: Creating posters using the ecosystem and biome vocabulary to review.

Sources:

Energizer Video: <https://www.brainpop.com/science/ecologyandbehavior/ecosystems/>

Biome Map (click on the world image): <https://askabiologist.asu.edu/explore/biomes>

General Biome Websites

<https://askabiologist.asu.edu/explore/biomes> http://www.blueplanetbiomes.org/world_biomes.htm

<http://www.cotf.edu/ete/modules/msese/earthsysflr/biomes.html>

<https://earthobservatory.nasa.gov/Experiments/Biome/biotundra.php>

<http://kids.nceas.ucsb.edu/biomes/index.html>

More Links: <http://ths.sps.lane.edu/biomes/index1.html>

Boreal (Taiga) Forest

General: <http://www.blueplanetbiomes.org/taiga.htm>

Climate: <https://askabiologist.asu.edu/explore/taiga>

Animals: <https://askabiologist.asu.edu/animals-taiga>

Plants: <https://askabiologist.asu.edu/plants-taiga>

Desert

General: <http://www.blueplanetbiomes.org/desert.htm>

Climate: <https://askabiologist.asu.edu/explore/desert>

Animals: <https://askabiologist.asu.edu/animals-desert>

Plants: <https://askabiologist.asu.edu/plants-desert>

Grasslands

General: <http://www.blueplanetbiomes.org/grasslands.htm>

Climate: <https://askabiologist.asu.edu/explore/grassland>

Animals: <https://askabiologist.asu.edu/animals-grassland>

Plants: <https://askabiologist.asu.edu/plants-grassland>

Rainforest

General: <http://www.blueplanetbiomes.org/rainforest.htm>

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Animals: <https://askabiologist.asu.edu/animals-rainforest>

Plants: <https://askabiologist.asu.edu/plants-rainforest>

Savanna

General: <http://www.blueplanetbiomes.org/savanna.htm>

Climate: <https://askabiologist.asu.edu/explore/savanna>

Animals: <https://askabiologist.asu.edu/animals-savanna>

Plants: <https://askabiologist.asu.edu/animals-savanna>

Temperate (Deciduous) Forest

General: http://www.blueplanetbiomes.org/deciduous_forest.htm

Climate: <https://askabiologist.asu.edu/explore/temperate-forest>

Animals: <https://askabiologist.asu.edu/animals-temperate-forest>

Plants: <https://askabiologist.asu.edu/plants-temperate-forest>

Tundra

General: <http://www.blueplanetbiomes.org/tundra.htm>

Climate: <https://askabiologist.asu.edu/explore/tundra>

Animals: <https://askabiologist.asu.edu/animals-tundra>

Plants: <https://askabiologist.asu.edu/plants-tundra>

Marine

General: <https://www.earthclipse.com/ecosystem/marine-biome.html>

Climate: <http://ths.sps.lane.edu/biomes/marine4/marine4.html#climate>

Animals: <http://ths.sps.lane.edu/biomes/marine5/marine5.html#Animals>

Plants: <http://ths.sps.lane.edu/biomes/marine3/marine3.html#plants>

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Feedback: Make sure to check and load any documents onto the computers before starting the lesson. They currently have 11 computers but only 3 of them were fully functioning with internet connection. However, last minute we were informed that we actually didn't have the computers today so we improvised assigning each table one biome (5 biomes total) and handing out books from P.A.Y.s library to start their research. Many didn't understand how to take notes, they would just copy all the information down word for word. We instructed them to write at least 3 different animals, 3 different plants, and the climate of their biome in their notebooks. We told them at the beginning this research is important because tomorrow you will use it for research. Then we came around with our laptops to use the links provided to supplement and fill in the gaps in their notes. We then showed the ecosystem video on our laptops in small groups simply discussing the questions and not actually handing out the worksheet.

Biome Research Links

Directions: Use the following links to complete your biome graphic organizer. You may use either a class textbook, non-fiction book, and/or the following links. Copy and paste the links into a new a Google tab to explore the website.

Each member of your team must have a role. One person is the time keeper; you have 4 links to use so spend about 10 minutes reading on each. One person is the note taker. One person is the computer controller. You can alternate after each link so everyone has a turn with each role.

1st: Biome Map (click on the world image):
<https://askabiologist.asu.edu/explore/biomes>

Websites:

General Biome

<https://askabiologist.asu.edu/explore/biomes>
http://www.blueplanetbiomes.org/world_biomes.htm
<http://www.cotf.edu/ete/modules/msese/earthsysflr/biomes.html>
<https://earthobservatory.nasa.gov/Experiments/Biome/biotundra.php>
<http://kids.nceas.ucsb.edu/biomes/index.html>

Boreal (Taiga) Forest

General: <http://www.blueplanetbiomes.org/taiga.htm>
Climate: <https://askabiologist.asu.edu/explore/taiga>
Animals: <https://askabiologist.asu.edu/animals-taiga>
Plants: <https://askabiologist.asu.edu/plants-taiga>
More Links:<http://ths.sps.lane.edu/biomes/index1.html>

Desert

General: <http://www.blueplanetbiomes.org/desert.htm>
Climate: <https://askabiologist.asu.edu/explore/desert>
Animals: <https://askabiologist.asu.edu/animals-desert>
Plants: <https://askabiologist.asu.edu/plants-desert>
More Links:<http://ths.sps.lane.edu/biomes/index1.html>

Grasslands

General:
<http://www.blueplanetbiomes.org/grasslands.htm>
Climate: <https://askabiologist.asu.edu/explore/grassland>
Animals: <https://askabiologist.asu.edu/animals-grassland>
Plants: <https://askabiologist.asu.edu/plants-grassland>
More Links:<http://ths.sps.lane.edu/biomes/index1.html>

Rainforest

General: <http://www.blueplanetbiomes.org/rainforest.htm>

Climate: <https://askabiologist.asu.edu/explore/rainforest>

Animals: <https://askabiologist.asu.edu/animals-rainforest>

Plants: <https://askabiologist.asu.edu/plants-rainforest>

More Links: <http://ths.sps.lane.edu/biomes/index1.html>

Savanna

General:

<http://www.blueplanetbiomes.org/savanna.htm>

Climate: <https://askabiologist.asu.edu/explore/savanna>

Animals: <https://askabiologist.asu.edu/animals-savanna>

Plants: <https://askabiologist.asu.edu/animals-savanna>

More Links: <http://ths.sps.lane.edu/biomes/index1.html>

Temperate (Deciduous) Forest

General: http://www.blueplanetbiomes.org/deciduous_forest.htm

Climate: <https://askabiologist.asu.edu/explore/temperate-forest>

Animals: <https://askabiologist.asu.edu/animals-temperate-forest>

Plants: <https://askabiologist.asu.edu/plants-temperate-forest>

More Links: <http://ths.sps.lane.edu/biomes/index1.html>

Tundra

General: <http://www.blueplanetbiomes.org/tundra.htm>

Climate: <https://askabiologist.asu.edu/explore/tundra>

Animals: <https://askabiologist.asu.edu/animals-tundra>

Plants: <https://askabiologist.asu.edu/plants-tundra>

More Links: <http://ths.sps.lane.edu/biomes/index1.html>

Marine

General: <https://www.earthecclipse.com/ecosystem/marine-biome.html>

Climate: <http://ths.sps.lane.edu/biomes/marine4/marine4.html#climate>

Animals: <http://ths.sps.lane.edu/biomes/marine5/marine5.html#Animals>

Plants: <http://ths.sps.lane.edu/biomes/marine3/marine3.html#plants>

More Links: <http://ths.sps.lane.edu/biomes/index1.html>

When your entire note sheet is filled out and you have visited all of your links, raise your hand for a teacher to come collect your finished notes. You then have three options. Each person on your team has 10 minutes to use the computer for whichever option they want. Make sure everyone has their 10 minutes.

Option 1: Explore another type of biome by clicking on a different link

Option 2: Practice Vocabulary from each week thus far with online flashcards and games: <https://quizlet.com/osgibbs6/folders/pay>

Name: _____, _____ & _____

Date: _____

Biome: _____

Biome Computer Research Project

Objective: With a group, research a land or water biome about its climate, plants, and animals. Then present your synthesized information with the class. You must have at least 5 animals, 5 plants, description of the climate and 3 fun facts for your biome.

Step 1: As a group, select a biome to research. Each group will research a different biome.

Step 2: With your group, assign roles for each member. Each member of your team must have a role. One person is the time keeper; you have 4 links to use so spend about 10 minutes reading on each. One person is the note taker. One person is the computer controller. You can alternate after each link so everyone has a turn with each role.

Step 3: With your group, research your biome. You may use science books and the provided websites (Biome Research Links Sheet). Record your gathered information below.

Click on the 1st Link to locate where your biome is! Color in the map below as to where your biome is in the world.

Biome: _____



Biome: _____

Circle the subject of the website: Climate Animals Plants General

Time Keeper: _____ Computer Controller: _____

Note Taker: _____

Biome: _____

Circle the subject of the website: Climate Animals Plants General

Time Keeper: _____ Computer Controller: _____

Note Taker: _____

Biome: _____

Circle the subject of the website: Climate Animals Plants General

Time Keeper: _____ Computer Controller: _____

Note Taker: _____

Biome: _____

Circle the subject of the website: Climate Animals Plants General

Time Keeper: _____ Computer Controller: _____

Note Taker: _____



Ecosystems Quiz

Name: _____
Date: _____
Class: _____

1. What nonliving things might you find in an ecosystem?

- a. Mammals, insects, and birds
- b. Plants, fungi, and lichen
- c. Rocks, air, light, and soil
- d. Bacteria and other microbes

2. How are populations different from communities?

- a. Populations consist of one species; communities consist of many species.
- b. Populations can contain plants and fungi; communities consist of animals only.
- c. Populations consist of many species; communities consist of one species.
- d. Populations consist of animals only; communities can contain plants and fungi.

3. What is a moose's habitat?

- a. The forests of North America
- b. The number of moose in a given area
- c. The plants and fungi that moose eat
- d. Its antlers

4. Which of the following is an example of an animal adapting to its environment?

- a. A bald eagle that cannot see well
- b. A fish that eats fish food
- c. A deer that drinks water
- d. A desert owl hunting at night to avoid heat

5. What can you infer about the kangaroo rat from the fact that it thrives in the desert?

- a. It must be very large
- b. It must eat cacti
- c. It must live in a very small community
- d. It must be able to survive on very little water

6. Lakes and oceans are examples of aquatic ecosystems. What does "aquatic" mean?

- a. Saltwater
- b. Water-based
- c. Freshwater
- d. Filled with fish

7. Which of the following is an example of a living thing interacting with a nonliving thing?

- a. A flower that's pollinated by a bee
- b. A plant and a fungus growing together as lichen
- c. A prairie dog that lives beneath the soil
- d. A beaver that cuts down trees with its teeth

8. Which of the following words best describes the desert ecosystem?

- a. Moist
- b. Arid
- c. Frigid
- d. Temperate

9. Why can't you find scorpions in the Arctic? Choose the best answer.



- a. Because they can't walk on ice
- b. Because they only like to catch warm-blooded prey
- c. Because their stingers don't work at cold temperatures
- d. Because their bodies are not adapted to life in the Arctic

10. What can you conclude about polar bears from the fact that they live in the Arctic?

- a. They would not be able to thrive in the desert
- b. They are not biologically related to other bear species
- c. They eat mostly scorpions and kangaroo rats
- d. They must be able to survive with very little water

MEMORANDUM



Ecosystems Quiz

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Date: _____
Class: _____

1. What nonliving things might you find in an ecosystem?

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- c. Frigid
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9.



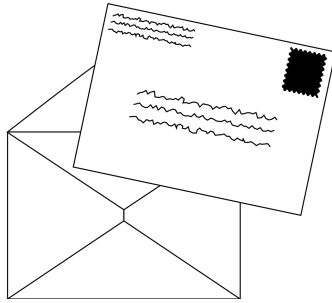
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Lesson 12: Pen Pal Letters



Objectives: Students will be able to practice writing English, learn the correct way to format a letter, include current vocabulary and use their biome research notes. Every student creates one letter to a student in the USA sharing about themselves and science topics to then receive in return a letter with information about USA and more science topics.

Standards Covering: *(Taken from Namibian Syllabi)*

Standard 1 Describe characteristics of an ecosystem in terms of living and non-living factors.

Materials: Pencils and their science notebooks only (letters will be photographed to be sent to USA classroom, not mailed for time purposes)

Prep-Work: Gather list of names from USA classroom to pair with a student at PAY.

Energizer: Biomes Share

Have students volunteer to share what they learned about their biomes; one animal, plant, climate and a fun fact! They can also share their favorite game from computer.

Instructions: Today we are going to use your biome research to share what we have learned and shared about yourself to students your age in Massachusetts! Point out on a map where Massachusetts is (use the map above the door).

Discuss with the class what a proper letter format is; outline on the board. Then explain to them what pen pals are and how they will each get one student's name from my sister's classroom who they will write a letter to. Feel free to discuss more about Olivia's sisters to give them a solid background (ie 5th grade science teacher, Olivia's older sister, we tested a lesson with her class and they loved it). Discuss what they think is important/good idea to include in the letter. (Make sure the following points get brought up).

- Correct letter format
- Introduce yourself (name, your grade, where you are from)
- Tell them about biome using your note sheet from the day before
- Use at least one vocabulary word from the week talking about what you are learning
- Ask them a question about themselves/America/science etc

Activity:

All students will receive one name of a student and will then proceed to write a letter to them in their science notebook. They must use at least one vocabulary word correctly from the last two weeks. Depending on the time and level of students either write the discussed list on the board of what to include or write out the template on the board for them to copy and fill in.

March 28th 2019

Dear _____,

My name is _____ and I live in _____. One thing you should know about where I am from is _____. I am in grade ____ and this week we have learned about _____. An ecosystem is the interaction of _____ and _____ organisms. On a large scale, a kind of area with multiple ecosystems are _____. I did research on _____ biome that has _____. My favorite part is _____. What are you learning in school? What is your favorite sport/food/activity?

Sincerely,

Answers:

March 28th 2019

Dear name of student,

My name is name of student and I live in Namibia. One thing you should know about where I am from is answers vary. I am in grade 5/6/7 and this week we have learned about ecosystems. An ecosystem is the interaction of biotic and abiotic organisms. On a large scale, a kind of area with multiple ecosystems are biomes. I did research on answers vary (desert/grassland/ocean/tundra/forest) biome that has answers vary. My favorite part is answers vary. What are you learning in school? What is your favorite sport/food/activity?

Sincerely,
Their Name

If students do not know how to spell a word, ensure them they can raise their hand for help since you want to have a really good letter to send to the students.

If there is time, have each biome team create a poster on their biome taking time to be creative.

They can create a landscape and draw the different animals and plants or just have more factual poster. Hand out markers to allow lots of color. Students can share with each other after the posters are complete. Hang posters on the wall.

Debrief: Have students share some of their questions they want answered/ are curious about. Ask why it is important to write letters and share your culture with others.

Lesson Plan for Next day: Review of the week's vocabulary

Future Lessons: Starting new section on Living Organisms - Adaptations.

Sources:

Photos in Order of Appearance:

janetleedesigns.(2014). Letter [Online image] Retrieved from

<http://www.freestockphotos.biz/stockphoto/16592>

Feedback: The students really enjoyed writing letters, especially the fact that they were going to an actual person who will write back to them. Many students wanted to send a photo as well so we took a photo of them holding their letters. This lesson allowed the 7th graders to write really in depth letters while the 5th graders were able to still write letters at their own pace. We incentivized them with a prize for whoever has the best letter to really make sure they are taking the time to check spelling and neatness. For the few students who did finish early we let them draw a photo with colored pencils at the bottom of their letter. We stressed no one is allowed to draw until your letter has been checked and is complete. They took the entire 1.5 hrs to complete the letter portion of the lesson and we did not make it to the biome posters today. The review of sharing out loud about their biomes at the the beginning of class was very minimal in participation, recommend sharing only after they have created their biome poster and are more familiar and comfortable to share their information.

Lesson 13: Ecosystem and Biome Review



Goal/Purpose: To allow the students to use and review vocabulary in a fun way.

Objectives: Learners will be able to review terminology from the week in both a visual poster and utilize the terms to win various games.

Materials: 6 Large sheets of paper (posters), markers, pencils.

Prep-Work: N/A

Energizer (15 mins): Recap Posters

Assign 2 or 3 vocabulary words to each group and have them write the definition and a drawing for each. These posters will be hung on the wall to show a visual of terminology taught this week and used as a reference. *Hand out poster sheet (may even be able to cut in half to limit the space and time) and markers only after definitions are written. Make sure to group the water cycle terms together so the Water Cycle can be put together on the wall for a visual.*

Key Vocabulary:

All Vocabulary from Week 3: Water Cycle, Environments, and Biomes;

Evaporation - Energy from the sun causes water to rise into the air and turn to vapor.

Condensation - When water vapor turns back into liquid, and forms clouds in the sky.

Precipitation - When water (which could be rain, snow, hail or sleet) falls from clouds in the sky and returns to the Earth.

Runoff - After precipitation when water collects and flows into lakes and rivers, and gets carried back to the sea.

Transpiration - Water vapor is released from the leaves of plants into the atmosphere.

Living Organisms (Biotic) - Have five characteristics: growth, feeding, reproduction, movement and respiration (further define terms if needed for clarification).

Nonliving Organisms (Abiotic) - Things which cannot grow, move, breathe, and reproduce.

Examples: Sunlight, temperature, water, air, wind, rocks, and soil

Ecosystem - Made of abiotic and biotic components that interact with each other.

Biome - A large geographic area with specific abiotic and biotic components.

Climate - Overall weather in an area over a long period of time

Forest - Kind of place most of the vegetation consists of trees

Tundra - Kind of place where it is cold, dry land near top of high mountains

Ocean - Kind of place filled with water, largest biome of them all

Grassland - Kind of place with large, open and windy places mostly covered by grass

Desert - Kind of place where rain hardly ever falls

Activity (35 mins): It is up to the teachers discretion what game to play, depending on time, class's attention, and class behavior. Note: Students may have never heard the games before and will need examples and instructions before starting.

Hangman: A game for two in which one player tries to guess the letters of a word, the other player recording failed attempts by drawing a gallows and someone hanging on it, line by line. Use current vocabulary for the word.

Race at the Board: Divide the class into two or three teams. One representative from each team comes to the board. You ask a question or give a problem (from the current vocabulary), and the first person to write the correct answer on the board wins a point for his/her team. The catch: the students at the board only get one try. If they all miss the question, you take the answer from the first person in the audience who raises his hand. Be sure to keep this game moving to minimize wasted time from students moving to and from the board.

Example of questions: Draw an animal/plant/climate you'll find in a _____ biome?

Or what is weather all year around - answer: climate

Game Show (i.e. Jeopardy): Draw a game board on the chalkboard, choosing categories based on the topics this week you want to review. When a student chooses "Desert for 200" simply glance through your notes for an easier question. "Grassland for 2000"? Just ask a harder question. The teacher can use these as examples:

Water Cycle: <https://jeopardylabs.com/play/water-cycle-jeopardy22>

Ecosystems and Biomes: <https://jeopardylabs.com/play/biomes-and-ecosystems>

<https://jeopardylabs.com/play/biome-jeopardy-game3>

Around the World: This classic individual game still works so well! The first two students pair off against each other. You ask a question, and whoever shouts the answer first wins. The winner stands and moves to the next contestant. The goal is to move as many seats as possible before losing, at which point the losing student sits in the seat of the person who bested him. The game ideally continues until one student makes it "around the world" and gets all the way back to his own seat. Often, though, the game simply ends when time is up, and the person

who traveled the farthest wins. One can focus on spelling to - just ask “Spell desert.” or “Spell the biome you live in.” (these are two varying level of questions asking the same thing, so you can make it more challenging for the older students.

Debrief/Recap (5 mins): Ask the students if they had fun today. By a raise of hands what was their favorite game? *So it can be noted for the next review session.*

Lesson Plan for Next day: Starting new section on Living Organisms - Adaptations and a great connection between adaptations and biomes is this jeopardy game:

<https://jeopardylabs.com/play/biome-jeopardy39>

Future Lessons: Life Cycle Lesson

Sources:

Game Ideas: <https://teach4theheart.com/7-review-games-that-wont-waste-your-time/>

Jeopardy Games: <https://jeopardylabs.com/>

Work Cited (Citations):

Sources in Alphabetical Order:

Johnson, M. Jeopardy labs. Retrieved from <https://jeopardylabs.com/>

Kardamis, L. 7 review games that won't waste your time. Retrieved from <https://teach4theheart.com/7-review-games-that-wont-waste-your-time/>

Photos in Order of Appearance:

Mvolz.(2018). World [Online Image] Retrieved from

<https://www.goodfreephotos.com/vector-images/kawaii-earth-vector-clipart.png.php>

Feedback: Posters took the full 50 minutes before the life skills teacher taught, so we didn't get to the games. We had planned on playing the Jeopardy Water Cycle game for review. Many students asked to use the books again as a reference to draw their biome's corresponding animals. The goal was to have them draw a picture of their biome with animals, plants, and climates related. The students who weren't there for biome research did a poster on ecosystems using non-living, and living as vocabulary terms. And those not there for either day did a poster on the water cycle to ensure all vocabulary was used in a poster.

Lesson 14: Adaptation



Objectives: Learners will be able to analyze how structural and behavioral adaptations help organisms survive.

1. Observe and identify specific adaptations of animals.
2. Give examples of structural and behavioral adaptations.

Standards Covering: *(Taken from Namibian Syllabi)*

Standard 1 Describe characteristics of slow-growing and fast-growing plants as an adaptation to a dry environment

Standard 2 Describe the adaptations of Welwitschia mirabilis in Namibia

Materials: All materials for bird beak lab

Energizer (5 mins): Designate different biomes to different corners of the room. Describe characteristics of the biome and have students move to the corners of the classroom depending on what biome they think the teacher is describing.

Instruction: Review animals that students researched in different biomes. Write 2 examples from each biome on the board. Ask the following probing questions:

- What would happen if the animals switched habitats?
- What adaptation features would be useful or useless in the new habitat?
- Do you think the animal could survive in the unfamiliar habitat?

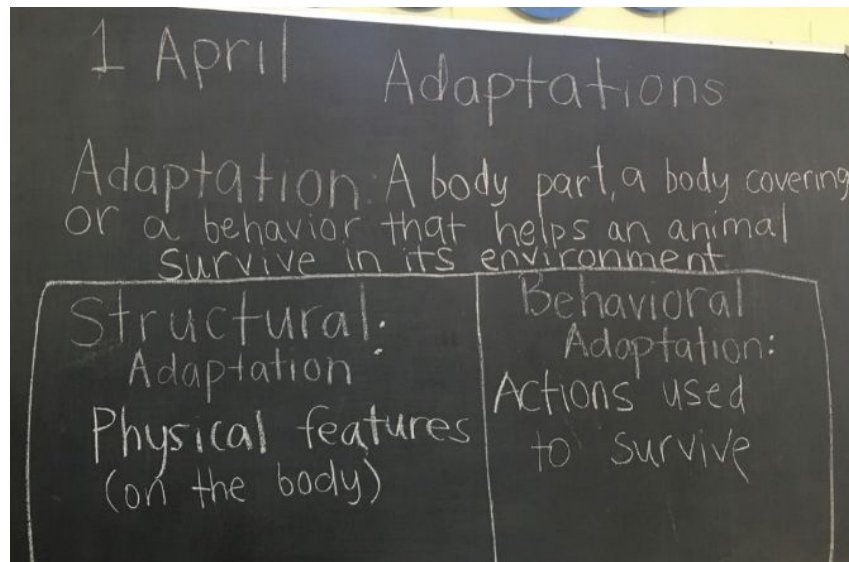
In order for animals to survive, they need to be able to adapt. In this lesson we will look at the types of adaptations animals can and do make. In a perfect world, animals would not need to

adapt. However, with constant changes to their *environment*, animals must adapt or face extinction. Over time, animals that are better adapted to their environment survive and breed. Animals that are not well adapted to an environment may not survive. Tell students that there are two basic ways that animals adapt to their habitats.

One way is by changing the way that they look. This is called a physical adaptation. For example, a deer can camouflage, or blend in, with its brown forest surroundings. A duck has webbed feet to help it swim in the water. Ask students to share some other physical adaptations that they know of.

Another way an animal adapts to its habitat is by changing the way it acts. This is called a behavioral adaptation. For example, a bear hibernates in the winter. Geese fly south for the winter. Ask students to share some other behavioral adaptations that they know of.

Talk about how plants grow at different rates. Trees in forests grow very fast, but cactuses grow slowly. This is an adaptation due to the amount of resources available to each plant. If they have more resources, they'll grow faster.



Key Vocabulary:

Adaptation - A body part, body covering, or behavior that helps an animal survive in its environment. *Something special about an animal or plant that helps it survive in its environment.*

Structural Adaptation - Physical features of the plant or animal.

Behavioral Adaptation - The actions of a plant or animal takes to survive in the environment.

Camouflage - A color or shape in an animal's body covering that helps it blend into its environment.

Activity:**1. Animal Adaptation Cards**

Each team gets animal cards to learn about adaptations. Fill out worksheet.

Debrief: Ask students to share adaptations they learned about in each category. Compare and contrast the behavioural adaptations that the zebra and the skunk use to defend against predators.

2. Bird Beak Lab

Instructions for the bird beak lab are typed out at the end of the lesson.

Debrief: Ask learners what tool they thought was the most effective for each food. Ask them how many pieces of food they obtained and what tool they used to obtain it. Ask if any other students got more of that piece of food and what tool they used. Arrive at the conclusion that different beaks are more effective for different foods which is why birds adapt different beaks.

3. Create a New Animal

Instructions for the bird beak lab are typed out at the end of the lesson.

4. Camouflage in the Classroom

Instructions for the bird beak lab are typed out at the end of the lesson.

Debrief/Recap (5 mins):

Ask the students to share the coolest adaptation they learned about.

Lesson Plan for Next day: Life Cycles

Future Lessons: Food Chains and Food Webs

Sources:

Key Vocabulary Definitions and Background Info for Instruction:

<https://www.zoosociety.org/pdf/GuidedTours/AnimalAdap.pdf>

Adaptation Cards: <https://connectplus.pasco.k12.fl.us/mrozycki/wp-content/uploads/2017/10/b-s-sort.pdf>

<https://www.uen.org/lessonplan/download/35219?lessonId=28334&segmentTypeId=2>

Bird Beak Activity:

https://www.msmogckskclassroom.com/uploads/1/7/0/9/17091200/sci_20_adaptations_quick_lab_.pdf

<https://www.dentonisd.org/cms/lib/TX21000245/Centricity/Domain/667/Bird%20Beak%20Adaptations%20Lab.pdf>

http://www2.nau.edu/lrm22/lessons/bird_lab/bird_lab.html

Create Your Own Animal Activity:

<https://www.marwell.org.uk/education/free-resources/key-stage-3>

https://www.marwell.org.uk/media/other/create_your_own_animal.pdf

<https://www.marwell.org.uk/downloads/ks3adaptationpacknott.pdf>

<https://www.education.com/lesson-plan/amazing-animals-adaptations/>

Good Resource for the Future:

https://www-k6.thinkcentral.com/content/hsp/science/fusion/pangeatools_na/player/player.html?los=G5_LI_00039-PU-INV&grade=5&userType=student&viewMode=browse

Good Video: <https://study.com/academy/lesson/animal-adaptations-lesson-for-kids.html>

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<https://en.wikipedia.org/wiki/Beak#/media/File:BirdBeaksA.svg>

Feedback: We did not get to the Animal Creation activity or the Classroom Camouflage activity. These activities were prepared as backup activities and can be used in the future. When teaching the students the vocabulary words, we should've sounded out the words and had everyone practice saying them together because the learners are English language learners. It's important moving forward to be cognizant of using large English words and making sure they can pronounce the vocab words we are teaching. The definition of adaptation should also be refined to be more concise.

In the adaptation card activity some of the learners struggled to decide if the adaptation was structural or behavioral. The language used on the cards could be made more concise so that it is clear what category the adaptation falls into. One teacher was needed at every table to explain some of the cards. Six cards were given to each table and four were examples of structural adaptations while two were behavioral adaptation examples. In the future, three examples of each should be given to each table.

The learners had a lot of fun with the bird beak activity, however this caused the noise level to be louder than usual and we felt like we were yelling the whole time. More explicit instructions should be given at the beginning of the activity. Each tool and each type of food should be shown to the class. If less tools are used as beaks then the lesson would not take as long. Also many of the food types could be used with different tools, like the popcorn, gummy worms, and mini marshmallows. Different food types could be chosen to get more definitive results. Additionally, students could be asked to graph their results on a bar graph to work on graphing skills if time provided. Finally, there were many empty boxes on the chart and some students struggled to understand where to fill in the number of the food they collected. To address this, the chart could be edited to have a picture of the tool followed by a column for them to write what food they are going to collect and then a column for the amount of food that was collected. This would clear up the misunderstanding and misuse of the table. This new chart is presented within this PDF document.

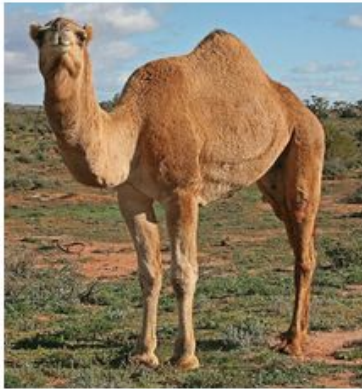
Armadillos have a coat of armor on their backs which keeps predators from eating them



Crabs live in the ocean. Their claws help them catch food and defend against predators.



Camels have humps on their back that store energy. Camels can go a long time without eating .



African Bush Elephants have big ears which help to keep them cool. Their long trunk helps them grab and pick things up.



Penguins are birds but their wings don't allow them to fly. Instead their wings help them swim and catch food.



Monarch butterflies migrate to warmer places in the winter.



Cactuses have spines instead of leaves so they lose less water in the desert. They can also store water in their stems.



Zebras live in herds to protect from predators.



Chameleons have skin that changes color to help them blend in with their surroundings. This is called camouflage.



Fish have gills that allow them to breathe in the water.



Skunks can release a stinky spray from under their tails when there is a predator near.



Possoms play dead to confuse their predators.



Adaptations

An adaptation is _____.

Structural adaptations are _____ _____.	Behavioural adaptations are _____ _____.
Example 1:	Example 1:
Example 2:	Example 2:

MEMORANDUM

Adaptations

An adaptation is **something special about an animal or plant that helps it survive in its environment.**

Structural adaptations are changes to the body.	Behavioural adaptations are actions that the organism does.
Example 1: Answers will vary	Example 1: Answers will vary
Example 2: Answers will vary	Example 2: Answers will vary

BIRD BEAK LAB

Purpose:

To have the students discover how structural adaptations in animals give them advantages and disadvantages while feeding. This should connect to the broader concept that adaptations help animals live in specific environments.

Materials:

<p>“Beaks”</p> <p>Spoons (1 for each group)</p> <p>Clothespins</p> <p>Toothpicks</p> <p>2 Pencils per group</p> <p>Ladle with holes</p> <p>Binder Clip</p> <p>Aluminum foil tins or plates</p>	<p>“Food”</p> <p>Gummy worms</p> <p>Round chocolate candies</p> <p>Marshmallows</p> <p>Dry macaroni</p> <p>Dry rice</p> <p>Large object</p>
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Procedure:

***Anyone who is not responsible enough to maintain safe behavior at all times will no longer participate in the activity and will become an observer. ***

1. Pass out one bird beak sheet to each table. Explain how physical adaptations in each beak helps the bird feed. They all eat different things and the shape of the beak allows for the bird to catch their prey easier.
2. Pass out materials to each group.
3. Each learner in the group will choose one tool. Each learner will also get a plastic cup. Each learner will also pick one food to go after with the tool.
4. You are now a very hungry bird. The tool you have selected is your “beak”. You can only use your beak to pick up food.
5. The cup is your stomach. It must remain upright at all times. You must hold your beak in one hand, and your stomach in your other hand, close to your body. Only food that is placed in the cup by the beak has been “eaten”. You can only choose one type of food to eat per tool! You cannot go after the same type of food twice.
6. The food items are in your “habitat”(box). When the teacher says GO, you will have 10 seconds to feed (or until the food runs out). Collect as much food in your stomach as possible until the teacher says STOP.
7. When the teacher says “stop”, students will empty their stomachs and count the contents. Record data in the Data Table. Place the food items from your cup into the “eaten” pile – DO NOT RETURN THE FOOD ITEMS TO THE HABITAT.
8. Have every student pass their beak to the right and repeat until they’ve used every beak

CAMOUFLAGE IN THE CLASSROOM

Objective:

Students will demonstrate their understanding of camouflage by designing a butterfly that blends into a classroom "habitat."







Materials:

- Paper butterfly patterns for each student
- Butterfly pattern
- Markers, crayons, or colored pencils
- Colored toothpicks or paper clips

Student Activity:

1. Give each student a copy of the butterfly pattern.
2. Ask the students to pretend your classroom is a butterfly habitat. Have each student look around the room and select a specific home or habitat for his or her individual butterfly.
3. Have each student color his/her butterfly pattern with markers, crayons, or colored pencils so that it will be camouflaged in this habitat.
4. Ask your students to place the butterflies in their habitat without burying them. The butterflies must be out in the open, but well-camouflaged.
5. Invite students from another class to see how many of your butterflies they can find.

Bird Beak Activity

Types of Food <i>Cross out each food once you have used them</i>	Beak Types	Food Type Chosen	Number of pieces collected
			
Gummy worms Corn kernels			
Rice Marshmallows			
Round candy Dry Pasta			
			
			



Generalist



Insect catching



Generalist



Insect catching



Grain eating



Coniferous-seed eating



Grain eating



Coniferous-seed eating



Nectar feeding



Fruit eating



Nectar feeding



Fruit eating



Chiseling



Dip netting



Chiseling



Dip netting



Surface skimming



Scything



Surface skimming



Scything



Probing



Filter feeding



Probing



Filter feeding



Aerial fishing



Pursuit fishing



Aerial fishing



Pursuit fishing



Scavenging



Raptorial



Scavenging



Raptorial

CREATE YOUR OWN ANIMAL

Objective: Have students apply what they've learned about animal adaptations and reach the highest level of Bloom's Taxonomy.

Materials:

Paper

Colored pencils/markers/crayons

Clay if available to make 3D models

Instruction:

1. Explain that students will be creating a new animal! They can use supplies to draw a picture of their animal or create a three-dimensional replica.
2. First, come up with a new environment with crazy geographical features. See example. Ask the students to close their eyes and visualize the environment as you describe the setting.
3. Tell the students that they will be creating a new animal that has at least three adaptations that help the animal survive in this environment.
4. Print out a few adaptation example booklets to allow students to look through for more ideas if they are stuck.
5. When students are finished creating their animals, they must present their animals to the class explaining the adaptations and how they help the animal survive.
6. Model choosing a habitat and creating an animal. Engage the class in discussing the physical adaptations.

ANIMAL CREATION

Environment:

- Very hot
- Volcano that erupts every summer
- Very tall trees with pools of water at the top
- Really strong winds

Instruction:

Create an animal that has at least 3 adaptations that help them survive in this environment.

What adaptations does your animal have?

1.

2.

3.

CAMOUFLAGE IN THE CLASSROOM

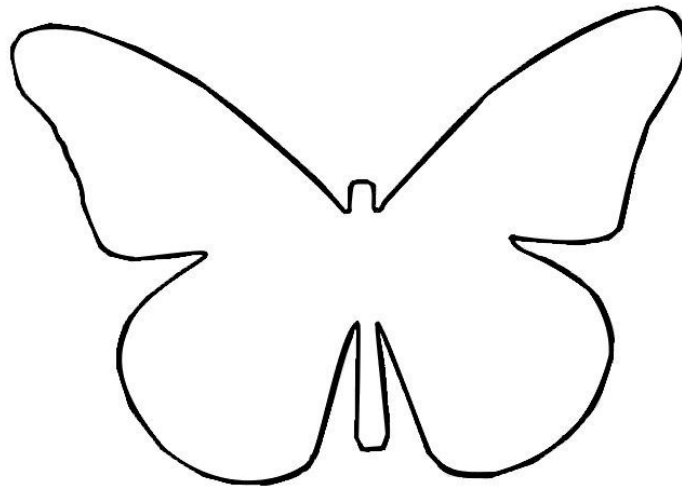
Objective: Students will demonstrate their understanding of camouflage by designing a butterfly that blends into a classroom "habitat."

Materials:

- Paper butterfly patterns for each student
- Markers, crayons, or colored pencils
- Colored toothpicks or paper clips

Student Activity:

1. Give each student a copy of the butterfly pattern.
2. Ask the students to pretend your classroom is a butterfly habitat. Have each student look around the room and select a specific home or habitat for his or her individual butterfly.
3. Have each student color his/her butterfly pattern with markers, crayons, or colored pencils so that it will be camouflaged in this habitat.
4. Ask your students to place the butterflies in their habitat without burying them. The butterflies must be out in the open, but well-camouflaged.
5. Invite students from another class to see how many of your butterflies they can find.



Lesson 15: Life Cycles



Objectives: Learners will be able

- To understand what a life cycle is
- To identify the four stages of butterfly life cycle: *egg, caterpillar/larva, chrysalis, butterfly*
- To work with each other in a competitive game environment

Standards Covering: (*Taken from Namibian Syllabi*)

Standard 1 Observe and draw different stages in the life cycle of a simple invertebrate

Standard 2 State the different stages in the life cycle of a simple invertebrate

Materials: Chalk, worksheet, pencils

Prep-Work: Make sure desks are arranged to allow space for game and conduct lesson when learners have already been introduced to Rock/Paper/Scissors.

Energizer (5 mins): Head, Thorax, Abdomen Song

INSECT'S BODY (Tune: "Head, Shoulders, Knees, and Toes")

Head (Point to head)

Thorax (Point to chest)

Abdomen – abdomen! (Point to stomach)

Head, thorax, abdomen – abdomen!

Two eyes (Point to eyes)

Six legs (Wiggle 3 fingers on each hand)

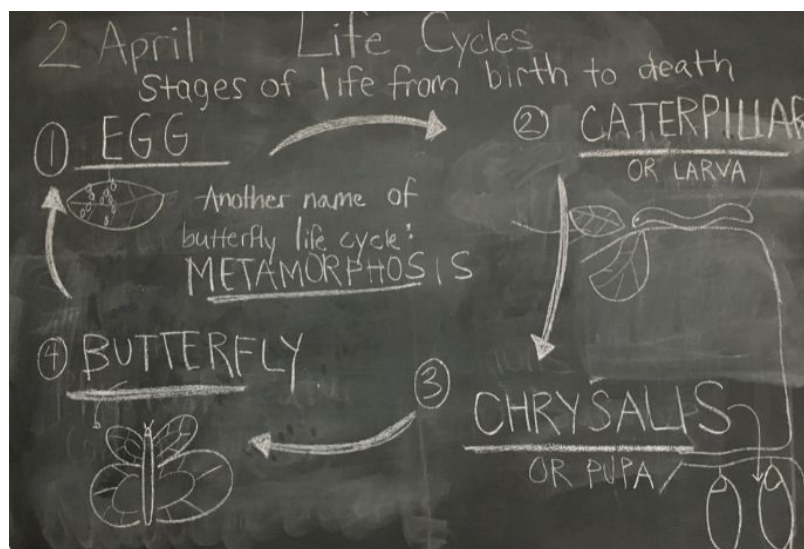
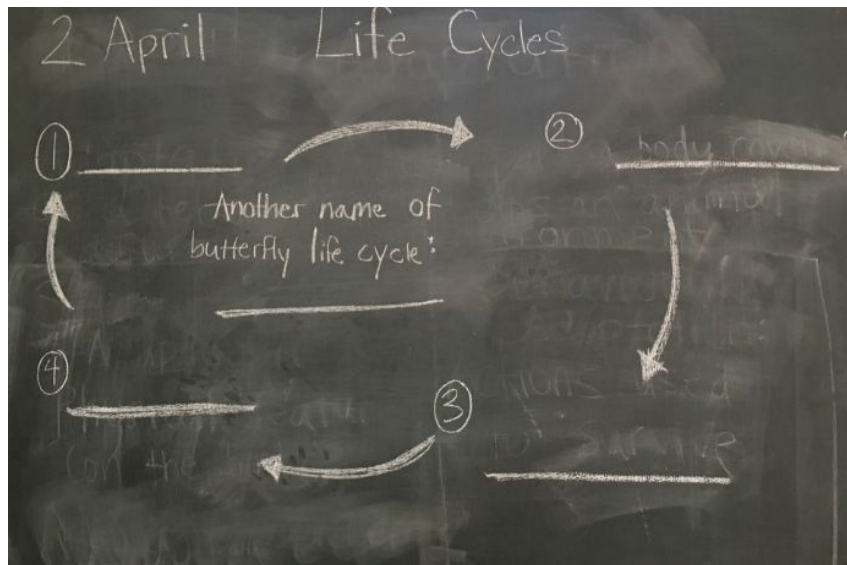
Two antennae (Stick 2 fingers up)

Maybe wings (Flap arms as wings.)

Head, thorax, abdomen – abdomen!

Transition (5 mins): Now that we have learned the different parts of butterfly, let's discuss the stages of their life cycle. Today we will discuss what a life cycle is, ask the students "Do humans look the same during their entire life?" *No, they don't because they too have their own life cycle. Turn to the person next to you and discuss the stages of a human life cycle. (The students should discuss baby, child (toddler, teenager, young adult), adult, elderly). Share out to the class.*

Butterflies need to complete four phases before they are actually butterflies. Does anyone know what one phase or stage is called? *Instructor can write vocab terms on the chalkboard, if no student knows then proceed to introduce them. Hand out worksheet to fill out vocabulary.*



Key Vocabulary (10 mins): Presenting the information, creating Quizlet for review

Life Cycle - Stages of life from birth to death.

Egg - First stage of the life cycle: Small round eggs are laid on leaves.



Caterpillar - Second stage in the life cycle: Egg hatches into a larva/caterpillar.



Chrysalis - The larvae/caterpillar creates this structure around itself and while inside of it, transforms into a butterfly.



Adult Stage - When the butterfly hatches from its chrysalis, it becomes a true butterfly. This means it is time to mate and find a place to lay eggs.



Challenge Word of the Day:

Metamorphosis - Transformation from a young form to an adult form in multiple stages.

Activity (20 mins):

Level I: Bring the class together and act out the monarch life cycle. *Write the levels with the corresponding moves on the board to have as a reference throughout the game for the students to keep referring back to if needed.*

1. Squat, and form a ball to act out the egg. Butterflies lay eggs on specific plants, like milkweed for monarchs. Monarch butterfly eggs are very tiny, about the size of a pencil tip.
2. Next, stand up and open and close your hands in front of your face to mimic a large mouth. You are now caterpillars (larva) and eat constantly to grow quickly.
3. Then put your hands down and spin slowly. You are a chrysalis spun from silk thread. Butterflies average about 2 weeks in chrysalis.
4. Lastly, gently move your arms up and down to mimic flapping wings - you are now a mature butterfly.

Once students know the four stages of a butterfly's life cycle and their corresponding actions, they are ready to play. Tell the students they are going to act out the life cycle of a butterfly but with a twist! Verify that all students know how to play Rock, Paper, Scissors. Review the rules and when to "shoot" if needed. Designate each corner of the room to one of the four stages of the life cycle. This is where the students will go when they advance to each stage. Everyone starts as an egg. You must make your egg action (squat) until you find another egg to play against. Play Rock, Paper, Scissors with the other egg. The winner moves onto the next stage of the life cycle (in this case caterpillar), which is in a different corner of the room. Continue playing rock, paper, scissors against someone else who is in the same stage of the life cycle as you. Make sure you make the corresponding motion for your life cycle stage and say it aloud.

If you win, you move up to the next stage advancing to the next corner of the room until you are turned into a butterfly and stand in the middle. If you lose, go back a level (caterpillar to egg, chrysalis to caterpillar). Eggs stay an egg.

Bring class together to discuss the outcome of the activity: *If time allows, have students do a brief written reflection first in which they answer some of these questions:*

How many people became butterflies? Who was first to become a butterfly?

For them specifically, what was a challenge you faced? (i.e., trying to wait for the next caterpillar to arrive to can play against)

How did someone overcome it or a strategy you used?

How many people were able to make it forward to become a caterpillar?

How many people were able to make it forward to become a chrysalis ?

How many people remained an egg for the entire game?

How many other eggs did you compete with but lost every time?

Discuss: The actual time frame in each part of the life cycle

Why do you think some players never advanced through the life cycle?

Discuss: This happens to butterflies too - Why don't all butterflies complete the steps in the cycle? (die due to weather conditions, predators, chemicals, nature, etc.)

Level II: Have the students break up into teams of three or four. *Depending on the dynamic of the class and how the lesson is going thus far you can either create mixed teams (students of all levels, just ensure this is the case for all teams) or you can establish grade 5 teams, grade 6 teams, and grade 7 teams. This would allow you to give level appropriate assistance to each team.*

All teams will select an animal of their choice, discuss and establish its life cycle and then create their own "moves" for each stage (similar to how butterflies had an egg movement, standing up, spinning and arms out). Each move should somehow connect or relate to a specific aspect of their animal. For guidance, according to Namibian Syllabi: *It may be helpful to have related books available for students to refer too or worksheets/diagrams.*

Grade 5 Teams: Life cycles of a bird, a reptile, or a mammal ie *You may need to show them a diagram with the vocabulary terms and help explain to them.*

Mammals of Namibia: Elephants, antelopes, lions, wild horses, rhino, zebras

Birds of Namibia: Ostrich, pelican, flamingo

Reptile of Namibia: Chameleons, crocodiles, geckos, lizards, skinks, snakes, terrapins, tortoises, turtles

Grade 6 Teams: Life cycle of insects, amphibians, or fish (typically from local environment) ie Frogs (most common amphibians in Namibia) or Toads *You may need to show them without the vocabulary terms so they will have to determine what they are. Emphasize the difference of Frog vs Toad life cycle- the eggs are in different shapes from the start Frogs are clustered eggs and Toads are vertically aligned etc.*

Grade 7 Teams: Describe the life cycles of a local insect and a mammal. *Can discuss the difference of complete and incomplete metamorphosis.*

Mammals of Namibia: Elephants, antelopes, lions, wild horses, rhino, zebras

Insects of Namibia: Dragonfly, scorpion

Each team must write down the stages to prepare them to share to the rest of the class. *They should have each stage name written, their “moves” described and demonstrated in class, and their names in their science notebooks. These instructions will be written on the board:*

When a team is done, a teacher should look over their sheet to ensure it is correct. If a team has an incorrect life cycle of their animal, teacher’s can assist with corrections, point them in the right direction, or even running out of time suggest them working on it during homework time tomorrow, or looking more into tomorrow during class to ensure they have the correct information.

Once everyone seems to be wrapping up pull the class back together, and have teams share out one at a time their life cycles and their movements for each stage.

Debrief/Recap (6 mins):

What is one difference in life cycle of your group vs butterfly life cycle?

Discuss how life cycles are different lengths for different living things. Some are very quick, like a fly or insect in most cases, while others are very slow like humans!

What is one take away about life cycles?

Any other comments or questions about a butterfly life cycle? Or other animal life cycle?

Did we like this activity?

Tomorrow we will talk more about how things evolve.

Ask the students to give a thumbs up rating on how well they understand or still confused about life cycles. Thumbs up means they understand, thumbs in the middle means so-so and thumbs down mean they are still confused.

Worksheet (in class team assignment): Drawing and labeling the life cycle .

Lesson Plan for Next day: Review lesson about butterfly life cycles from the day before and the comparison of life cycles with varying animals. Perhaps play one of their versions they created. Start talking about food chains and basic ecology.

Future Lessons: Compare the similarities and differences of specific externally visible features of the following invertebrates: ants, flies, and butterflies etc.

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Feedback: Students loved starting with the song and really enjoyed learning the body movements too. We could've gone over the song one or two more times as a class, challenging the learners to speed up the song each time.

We went over the butterfly life cycle but saved the drawing of the stages of butterflies until the end of the class. The notes on the board were good, especially since we labeled the numbers of each stage this time. It was good to save for the end for two reasons. The first is that the learners tend to get fixated on the drawing parts and will take too long to complete their drawing. Saving it until the end limits the time they can take to complete the task. Second, it's a good way to go back and reinforce what we taught in the lesson.

The learners really liked the rock-paper-scissors game outside. We explained the rules of the game before we headed out, which worked well because everyone was paying attention to the directions. We debriefed the game outside which was a mistake because no one was focused and they had trouble listening. It would've worked better if we walked inside and did the debrief when the students were back in their desks.

When we introduced the Level II activity where groups would be choosing an animal and writing the life cycle stages, we told them that we could help them do research on the computer if they didn't know all of the stages. This was a mistake because the learners immediately wanted us to do the research for them and they didn't take time to think about the stages first. We also realized that we should've prepared research materials ahead of time for the learners to utilize. They used some of the classroom books, but a better way to conduct the activity would've been to have a list of organisms for the groups to choose from and materials prepared for each group to learn about the life cycle.

Organisms to prepare research for next time: bees, one bird, one reptile, one mammal, amphibians, fish.

Name: _____

Date: _____

Insect's Body (Tune: "Head, Shoulders, Knees, and Toes")

Head (Point to head.)
Thorax (Point to chest.)
Abdomen – abdomen! (Point to stomach.)
Head, thorax, abdomen – abdomen!
Two eyes (Point to eyes.)
Six legs (Wiggle 3 fingers on each hand.)
Two antennae (Stick 2 fingers up.)
Maybe wings (flap arms as wings.)
Head, thorax, abdomen – abdomen!

Head (eyes, antennae)

Thorax
(wings,
legs)

Abdomen



Life Cycles are _____.


Fill in the life cycle of a butterfly:

<p>1. _____ A butterfly lays her eggs on a plant so that the caterpillars will have something to eat when they hatch.</p>	<p>2. _____ The job of a caterpillar is to eat, eat! Caterpillars can grow up to two inches long in just a few weeks.</p>
<p>3. _____ The caterpillar attaches itself upside down to a twig and transforms into a chrysalis to protect it while it turns into a butterfly.</p>	<p>4. _____ When the butterfly hatches from its chrysalis, it becomes time to mate and find a place to lay eggs.</p>

Another name for a butterfly life cycle is _____.

Name: _____

Date: _____

<p>Insect's Body (Tune: "Head, Shoulders, Knees, and Toes")</p> <p>Head (Point to head.) Thorax (Point to chest.) Abdomen – abdomen! (Point to stomach.) Head, thorax, abdomen – abdomen! Two eyes (Point to eyes.) Six legs (Wiggle 3 fingers on each hand.) Two antennae (Stick 2 fingers up.) Maybe wings (flap arms as wings.) Head, thorax, abdomen – abdomen!</p>	<p>Head (eyes, antennae)</p>  <p>Thorax (wings, legs)</p> <p>Abdomen</p>
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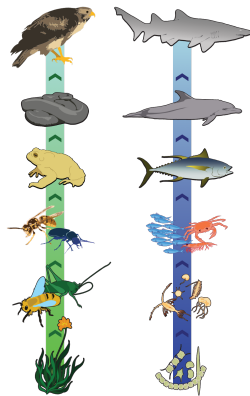
Life Cycles are stages of life from birth to death.

Fill in the life cycle of a butterfly:

<p>1. <u>EGG STAGE</u></p> <p>A butterfly lays her eggs on a plant so that the caterpillars will have something to eat when they hatch.</p> <p><u>For each stage, students draw their own picture</u></p>	<p>2. <u>CATERPILLAR</u></p> <p>The job of a caterpillar is to eat, eat! Caterpillars can grow up to two inches long in just a few weeks.</p>
<p>3. <u>CHRYSLIS</u></p> <p>The caterpillar attaches itself upside down to a twig and transforms into a chrysalis to protect it while it turns into a butterfly.</p>	<p>4. <u>BUTTERFLY</u></p> <p>When the butterfly hatches from its chrysalis, it becomes time to mate and find a place to lay eggs.</p>

Another name for a butterfly life cycle is METAMORPHOSIS.

Lesson 16: Introduction Food Chains



Objectives: Learners will be able to state the purpose of a food chain and food webs as obtaining energy for survival and give an example of a food chain.

Standards Covering: (Taken from Namibian Syllabi)

Standard 1 Describe the energy flow through living organisms within the chosen local environment (food chain, food web)

Standard 2 Discuss the importance of energy flow through an ecosystem

Materials: Science notebooks, pencils, worksheet, 30 plastic bags, tape, scrap paper (minimum 30 crumbled up balls, the more the better) *If doing food chain stack: 40 pages of paper, coloring utensils, tape*

Prep-Work: Prepare the food chain game materials. Pre-tape (or use sharpie) to label an inch up from the bottom of at least 10 sandwich bags indicating where the full stomach is for the grasshopper or the first food consumption in the food chain tag game.

Energizer (5 mins): Introduction to Food Chain

<https://www.youtube.com/watch?v=MUKs9o1s8h8>

If no projector is available, simply grab a laptop with the volume up. Split the class in two groups to gather around two laptops. This is a great introduction to food chains which reviews the ecosystem terms as well.

Transition (20 minutes): Fill out worksheet. Go over terminology filling in the worksheet, emphasizing that a food chain and food web are all about the way energy is transferred. And the difference of a food chain and a food web is the way it is connected.

Key Vocabulary:

Food Chain - Is the path of food energy from one organism to another in an ecosystem.

Food Web - Is an overlapping food chains with different pathways for the flow of food energy in an ecosystem.

Producer - Is an organism that can make its own food by using energy from its surroundings.

Consumer - Is an organism that eats other organisms or organic matter.

Decomposer - Are organisms that gets energy by feeding on dead materials and wastes.

Predator - Are wild animals that hunt, or prey on, other animals.

Prey - An organism that is killed and eaten by another organism.

Activity (35 mins):**I. Food Chain Game Outside:**

Focused on knowing that energy is needed from the food they eat, and what a balanced life cycle is. Instead of putting popcorn on the ground, use scrap paper and just roll it up into little balls so they won't blow around if it is windy. Prep: 30 sandwich bags, the grasshopper bags (maybe 10) has the least amount of paper required. The frog needs a full bag and the top level needs multiple frog bags full to survive.

You can also open it up to the students to pick the three or even add another level of the food chain. Have them tell you what animals they want to include. For example, Cactus → Ant → Snake → Fox.

Another version if students are struggling (This is a simpler version):

Assign roles (producer, consumer, carnivore, and decomposer) to the students evenly. If possible, you can divide the students up by their similarities making it easier for other students to identify their jobs ie all those wearing a blue shirt, short sleeves, sneakers, shorts etc. Or each person will be given a colored ribbon or piece of construction paper with their color taped on them. Give the directions to the students:

1. Decomposers tag producers, consumers (herbivores), and second order consumers (carnivores)
2. Consumers chase/tag producers
3. Second order consumers chase/tag consumers
4. Producers do not tag anyone

At the end of the game discuss what happened, who was left, and how does this relate to a food chain. Was it a balanced food chain? If not, why not? Who survived by not being tagged but still died because they couldn't collect enough food?

Additional ideas if more time is available.

II. Food Chain Game Inside:

1. Create a wadded ball of paper (4 layers of paper)
2. Pass the ball to a student. They name a producer and remove a layer of paper. They pass the ball.

3. Next student names a primary consumer and remove a layer of paper.
4. Game continues until paper/energy is gone.

III. Stacking Food Chain:

Stacking Food Chain



Have students create a stacking food chain. I printed on cardstock for durability.

Students can design their own set.

Prep: Pre-cut 5 strips of paper with various heights.

Instructions: Have each table discuss what food chain they want to create and the order of which the energy flows (aka the order of what is eaten first). The last animal in the food chain goes on the largest strip of paper and goes in decreasing order. This is to show what eats what in the food chain. Some examples of food chains include:

Desert: Grasses → Beetle → Termite → Lizard → Snake OR Grasses → Gemsbok → Person

Tundra: Lichen or Flowering plants → Caribou → Brown Bear → Bacteria and Fungi

Grassland: Red Oat Grass → Zebra → Henya

Forest: Grass → Rabbit → Snake → Owl → Fungi

Ocean: Kelp (Plant) → Pichard (Fish) → Snoek (Bigger Fish) → Person OR Mussel → Rock Lobster → Octopus → Shark

Only hand out stips of paper after group has their food chain planned out in their notebooks.

Write on the board: Each strip needs to have the name of the animal and its name in the food chain (ie producer, consumer, decomposer). Allow student to draw and color in their animals.

Debrief/Recap (5 mins):

What is the difference of a food chain and a food web?

What is the main component or reason for a food chain and food web? (The transfer of energy!!

The animals and plants need nutrients to survive)

Did you enjoy the game?

Lesson Plan for Next day: Food Chain and Food Web, showing students the difference of the two and going over more examples to be more comfortable with the material. Also going in depth with the different levels of consumers.

Future Lessons: Review Games of Living Organisms

Sources:

Activities: https://drive.google.com/file/d/1LkEt35VH2DsFyRGnXJP7yF4PbAnDOh_k/view

Online Food Chain Game with varying levels:

<https://www.cserc.org/sierra-fun/games/build-food-chain/>

Food Chain Flip Book Idea:

https://drive.google.com/file/d/1LkEt35VH2DsFyRGnXJP7yF4PbAnDOh_k/view

Work Cited (Citations):

Sources in Alphabetical Order:

Green, J., & Green, H. (Producers), & Aranda, M. (Director). (2015, April 21). *Fabulous food chains: Crash course kids #7.1*. [Video/DVD] Crash Course Kids. Retrieved from

<https://www.youtube.com/watch?v=MUKs9o1s8h8>

Build a food chain. An online game for kids. (n.d.). Retrieved April, 2019, from

<https://www.cserc.org/sierra-fun/games/build-food-chain/>

Hall, K. (n.d.). Pass the Energy. Retrieved April, 2019, from

https://drive.google.com/file/d/1LkEt35VH2DsFyRGnXJP7yF4PbAnDOh_k/view

Outdoor Biology Instructional Strategies. (1979,). Food chain game. *Delta Education* Retrieved from

<http://www.outdoorbiology.com/files/resources/activities/FoodChainGame.pdf>

Photos in Order of Appearance:

LadyofHats. (2012). Food Chain. [Online Image] Retrieved from

https://commons.wikimedia.org/wiki/File:Simplified_food_chain.svg

Feedback:

Due to computer day, WPI did not teach this lesson.

Name: _____

Date: _____

Energy Flow of Food Chains:

Starting Point
of All Food
Chains:

Producer:

Example:



Consumer:

Example:



Decomposer:

Example:

Food Chain: is the _____ of food _____ from one organism to another in an ecosystem

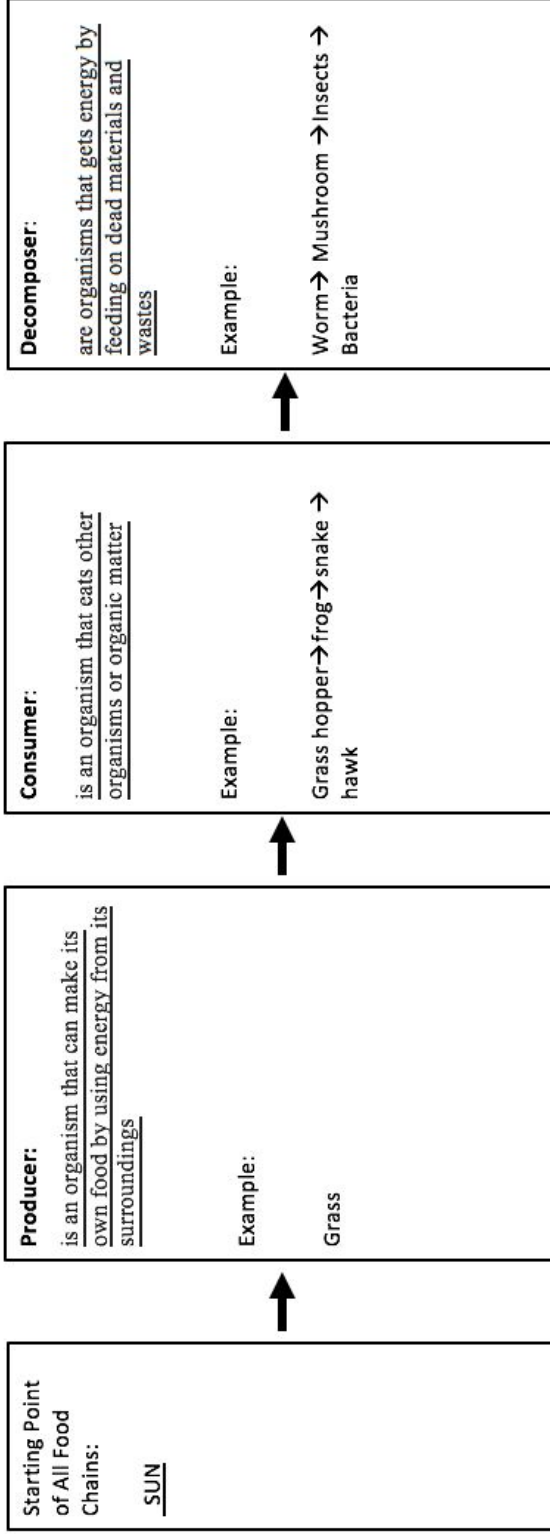
Food Web: is an _____ food chains with _____ pathways for the flow of food energy in an ecosystem

MEMORANDUM

Name: _____

Date: _____

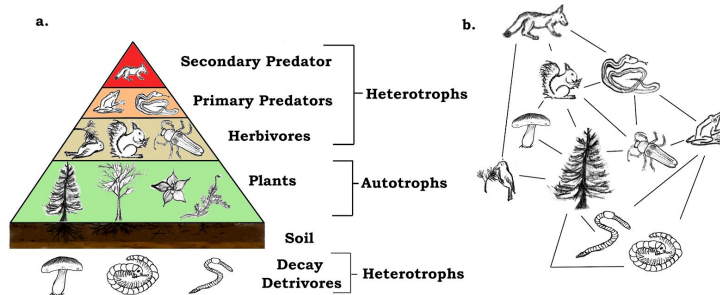
Energy Flow of Food Chains:



Food Chain: is the PATH of food ENERGY from one organism to another in an ecosystem.

Food Web: is an OVERLAPPING food chains with DIFFERENT pathways for the flow of food energy in an ecosystem.

Lesson 17: Food Chains & Webs



Objectives: Learners will be able to explain the difference between a food chain and food web as well as differentiate between the different types of consumers (herbivore, carnivore, omnivore) through songs, notes, and project.

Standards Covering: (Taken from Namibian Syllabi)

Standard 1 Describe the energy flow through living organisms within the chosen local environment (food chain, food web)

Standard 2 Discuss the importance of energy flow through an ecosystem

Standard 3 Explain ways in which heat and light affect the activities and behaviours of animals and humans in their local environment

Standard 4 Describe the relationships between plants and animals

Materials: Pencils, Science Notebook, Worksheet, Coloring Utensils, White Paper (40 pages), 5 Yellow pieces of paper, large ball of string

Prep-Work: Pre-cut stips of paper for the Food Chain chains

Energizer (15 mins): Creating a food web to get the students to use the vocabulary before writing it down.

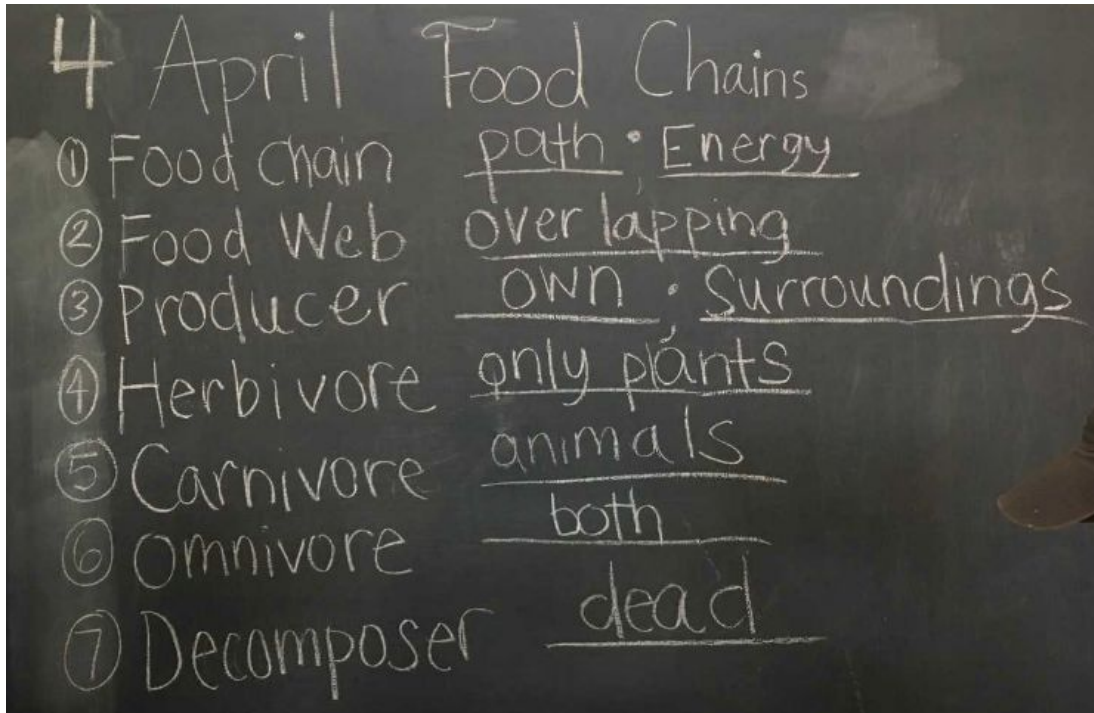
Food Web String Activity: (This can be done in 2 groups)

1. Print out pictures of organisms from each category of the food chain living in one ecosystem (1 per child)
2. On the back of each card, list the food the organism consumes for energy (ie: bull-snake consumes mouse) and if it is a consumer or producer
3. Students must:
 - a. First: Use string to connect one another just like the food web as discussed day earlier

- b. Second: As a class go through the whole food web and discuss how different consumers eat different things - sort consumers into carnivores, omnivores, and herbivores
4. Closure: Conversation using the vocabulary of omnivore, carnivore, producers, herbivores, and decomposers. Then have students describe the definition of each vocabulary word.

Transition & Notes (15 mins): Fill out vocabulary in a flip book worksheet which allows the student to draw a picture on the back of the word (right hand side) and the definition on the vocabulary on the left hand side; so when the flip is opened the picture is on the right and the words on the left. Make sure the students write the terminology down and fill in the definitions first and then allow them to draw and color. Make sure all students write their names on the back of the flip book.

Instructions for Writing on the Board:



Key Vocabulary:

Food Chain - Is the path of food energy from one organism to another in an ecosystem

Food Web - Is an overlapping food chains with different pathways for the flow of food energy in an ecosystem

Herbivores - Are animals that eats only plants or plant products (primary consumer)

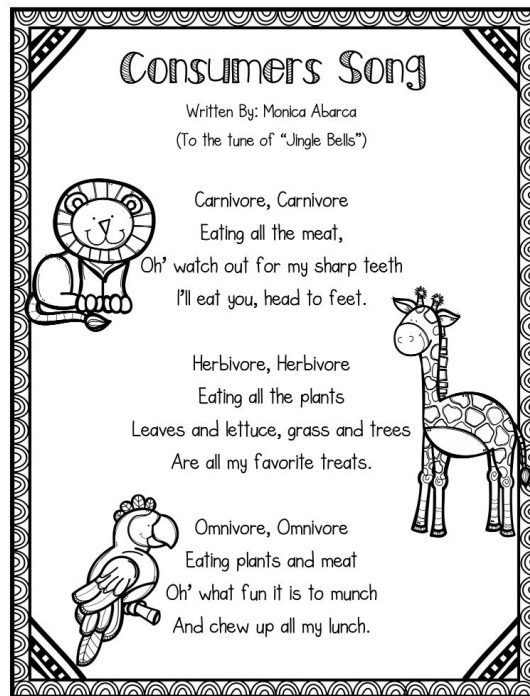
Carnivores - Are animals that eats other animals

Omnivores - Are animals that eat both plants and animals

Decomposer - Are organisms that get energy by feeding on dead materials and wastes

Activity (35 mins):

I. Consumer Song: Get the students to stand up and use the vocabulary in a song to remember the differences between them all.



II. Create Food Chain Chains (Mobile Project): Depending on time, students behavior, and supplies, either have each student create their own mobile, create them in pairs, or create them in groups of 6 (one per table).

1. Students are grouped together to sort the food chain of an ecosystem
2. Every food chain begins with energy from the sun, so the top of the chain mobile is a huge sun (use the yellow construction paper).
3. Create a chain for each "step" of the food chain: producer, herbivore, carnivore, top-consumer found in that ecosystem
4. Hang the mobiles in the classroom for students to showcase their work
5. The chains should hang in order of the food chain: sun, producer, herbivore, carnivore, top-consumer
6. The chains should resemble the chains used to countdown to Christmas



FOOD CHAIN CHAINS

A Mobile Project

1. Color and mount the sun on a paper plate or oak tag.
2. Choose a biome:
 - tundra
 - desert
 - forest
 - ocean
 - savannah
 - rain forest
3. Research and create a food chain with a producer, primary consumer, secondary consumer, tertiary consumer and decomposer.
4. Glue or staple links.
5. Attach to sun.
6. Write a paragraph describing the transfer of energy starting with the sun and ending with the decomposer.
7. Attach the paragraph on the back of plate.
8. Be creative!



III. Additional Food Chain Vocabulary: Worksheet

Debrief/Recap (5 mins):

What is the difference of food web and food chain?

What do all food chain and webs start with?

Who can give me an example of an herbivore/carnivore/omnivore?

What was your favorite activity from today? (Show of hands, the song/the web activity/mobile)

Anyone want to share their mobile?

Lesson Plan for Next day: Review games of Living Organisms, using vocabulary from entire week (from adaptations, life cycles, food chains, and food webs).

Future Lessons: Starting next week on Living Organism: Human Body

Sources:

Activities and Song: https://drive.google.com/file/d/1LkEt35VH2DsFyRGnXJP7yF4PbAnDOh_k/view

Additional Worksheet on Food Chain Vocabulary:

<https://primaryleap.co.uk/primary-resources/5859/Year-6/Science/Unit-6a-Interdependence-and-Adaptation/Food-Chain-Vocabulary/#.XKJXR-szaRs>

Work Cited (Citations):

Sources in Alphabetical Order:

Food Chain Vocabulary. (2015). Retrieved 2019, from

<https://primaryleap.co.uk/primary-resources/5859/Year-6/Science/Unit-6a-Interdependence-and-Adaptation/Food-Chain-Vocabulary/#.XL8sGJMzaRu>

Hall, K. (n.d.). Pass the Energy. Retrieved April, 2019, from

https://drive.google.com/file/d/1LkEt35VH2DsFyRGnXJP7yF4PbAnDOh_k/view

Photos in Order of Appearance:

Thompsma. (2011). Trophic Web [Online Image] Retrieved from

<https://commons.wikimedia.org/wiki/File:TrophicWeb.jpg>

Siyavula Education. (2014). Simple Food Chain [Online Image] Retrieved from

<https://www.flickr.com/photos/121935927@N06/13578545323>

Zirguez. (2018). Trophic Cascade [Online Image] Retrieved from

https://commons.wikimedia.org/wiki/File:Trophic_Cascade_1.svg

Adege. (2017). Mushroom [Online Image] Retrieved from

<https://pixabay.com/photos/mushroom-moss-h%C3%A4ublinge-mushrooms-2949539/>

Feedback: We didn't find string so instead for the energizer we gave out a card to each student where they had to think about who ate them (predator) and who they ate (their prey). They then had to find students with their predator and prey and create a path. Discuss with them the difference of webs and chains that they created. Next time split the cards up so they are all from one ecosystem; either if doing with the entire class have cards all from one ecosystem or split up by table and each table has a different ecosystem.

For the mobile, we only had 19 students so we had each student make their own.







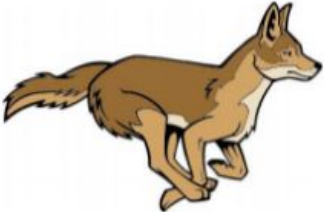





We made sure to say the goal was to create the longest and most unique food chain to encourage competition and have students focus to do well so they can be hung on the ceiling. I laid out the cards from the beginning throughout the tables for them to use a reference, many students used them to trace or get ideas.

We started the food chain at 3pm and they were focused the entire time and did not finish by 3:45pm. We had to continue working on them the next day. The class was quiet as they worked on their sun and producer chains so we played music. They sang along while we did work - they were really enjoying it. We also didn't have plates so we used yellow construction paper for the sun, green for the producer, white for all types of consumers, and brown for the decomposer

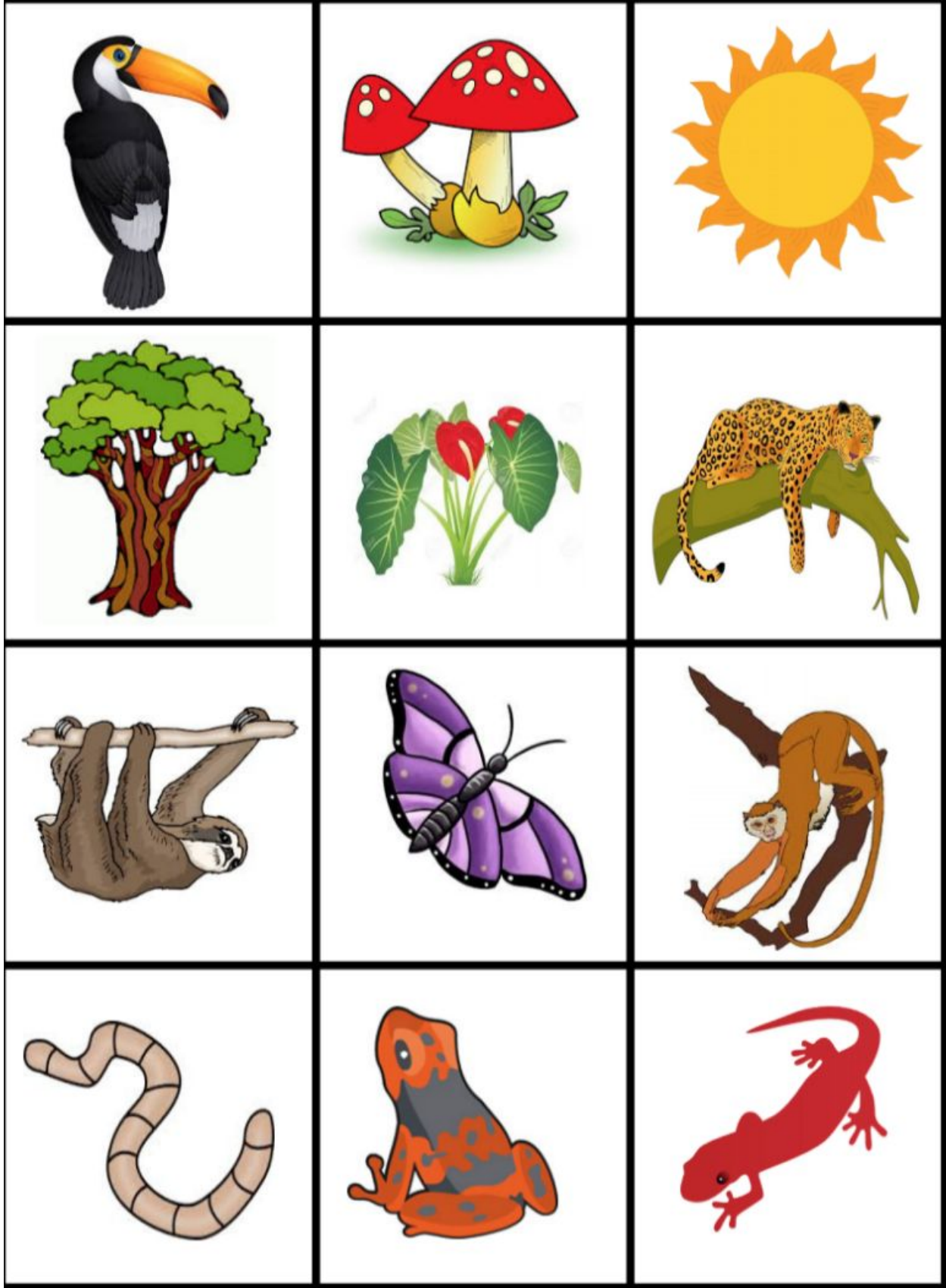
Common corrections during mobile project:

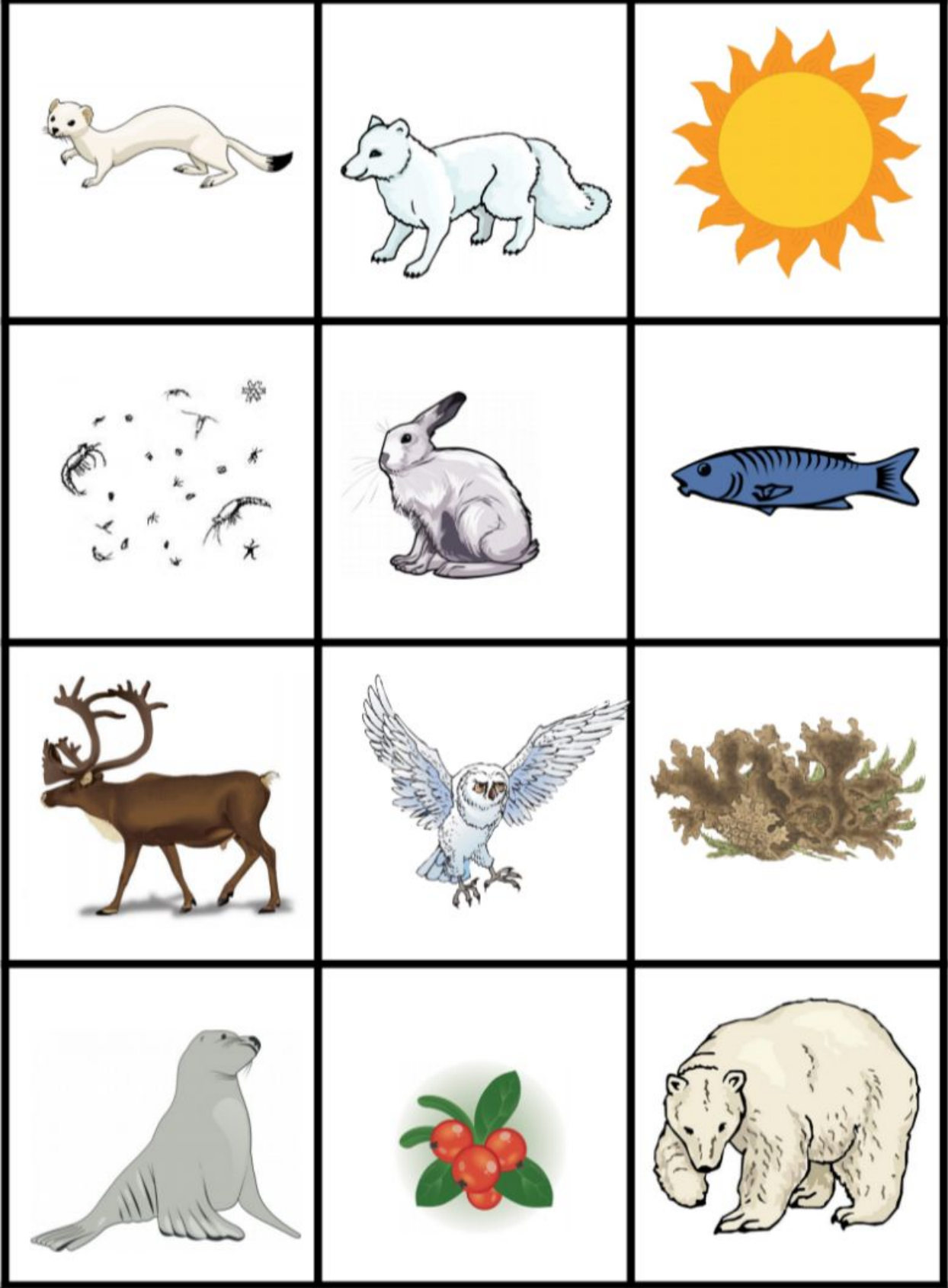
- Misconception to be more clear about - Animals for their food chain need to be from the same ecosystem; they can't create an octopus and a lion in their food chain mobile.
- Making sure each consumer is on a separate white paper each.

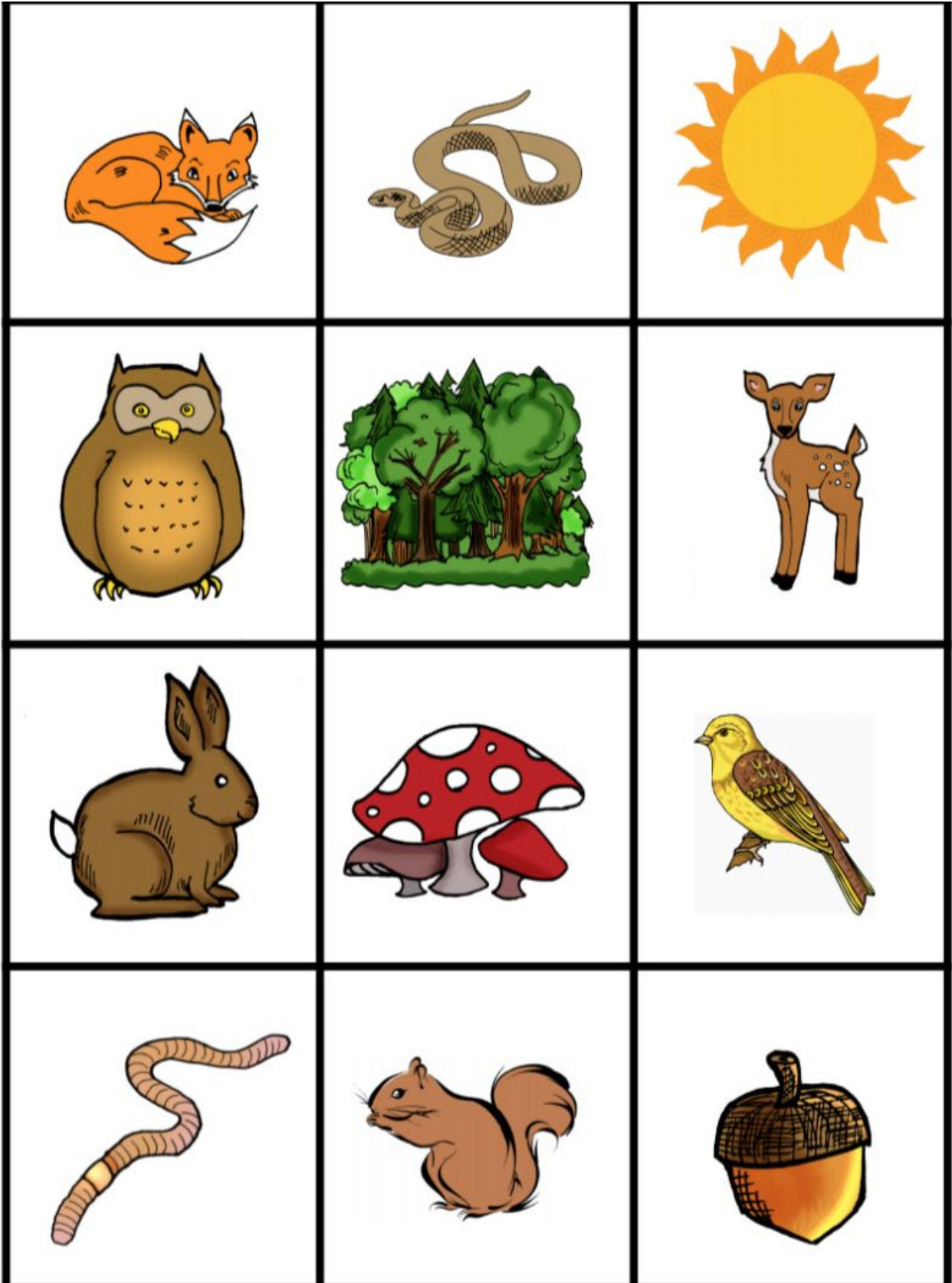
Matching Game Cards:

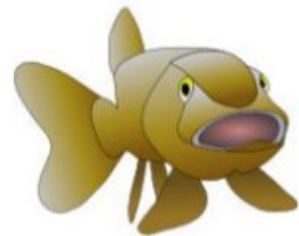
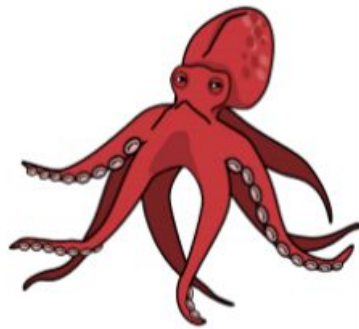
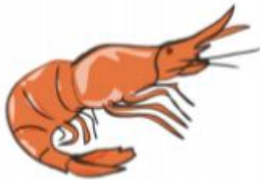
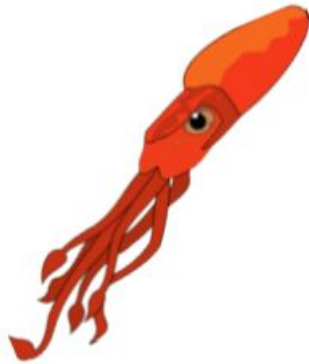
		
		
		
		











Additional Food Chain Vocabulary Sheet:

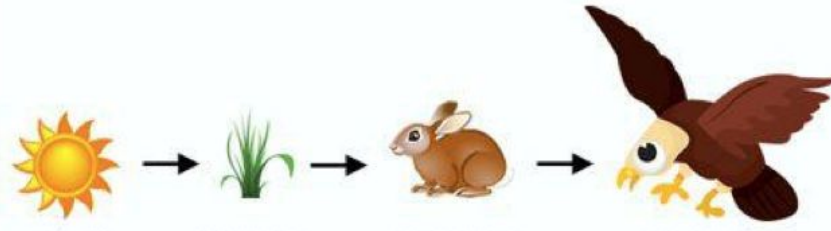
Name: _____

Date: _____

Food Chain Vocabulary

Word Bank

consumer	energy	herbivores	nutrients
scavenger	producer	fungi	web
food	omnivores	humans	chains



Read the sentences below and fill in the missing words from the word bank.

1. Every living plant and animal must have _____ to survive.
2. Animals and plants get the energy they need from their _____.
3. Plants are called _____.
4. Animals, including herbivores, carnivores and omnivores are called _____.
5. Animals that eat only plants are called _____ and animals that eat only animals are called carnivores.
6. _____ are animals that eat both animals and plants.
7. A _____ is an animal that eat both animals and plants.
8. Decomposers help put _____ back into the soil for plants to eat.
9. Worms, bacteria, and _____ are example of decomposers.
10. There are many food _____ and most plants and animals are part of several chains.
11. _____ are at the end of the food chain. They eat both plants and animals.
12. Many food chains joined together to form a food _____.

MEMORANDUM

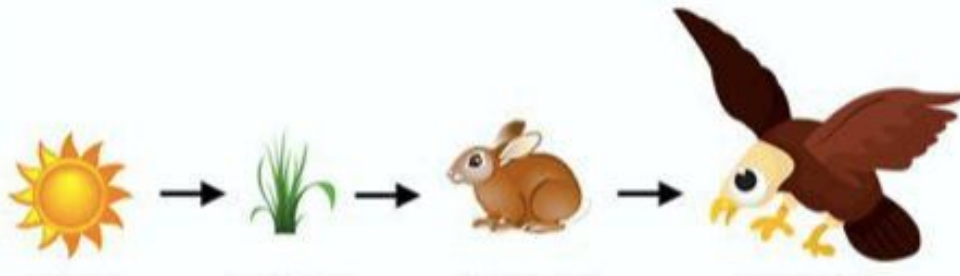
Name: _____

Date: _____

Food Chain Vocabulary

Word Bank

consumer	energy	herbivores	nutrients
scavenger	producer	fungi	web
food	omnivores	humans	chains



Read the sentences below and fill in the missing words from the word bank.

1. Every living plant and animal must have energy to survive.
2. Animals and plants get the energy they need from their food.
3. Plants are called producers.
4. Animals, including herbivores, carnivores and omnivores are called consumers.
5. Animals that eat only plants are called herbivores and animals that eat only animals are called carnivores.
6. Scavengers are animals that eat both animals and plants.
7. An omnivore is an animal that eat both animals and plants.
8. Decomposers help put nutrients back into the soil for plants to eat.
9. Worms, bacteria, and fungi are example of decomposers.
10. There are many food chains and most plants and animals are part of several chains.
11. Humans are at the end of the food chain. They eat both plants and animals.
12. Many food chains joined together to form a food web.

Consumer Song

Written Monica Abarca
(To the tune of "Jingle Bells")

Carnivore, Carnivore

Eating all the meat,

Oh'watch out for my sharp teeth

I'll eat you, head to feet.

Herbivore, Herbivore

Eating all the plants

Leaves and lettuce, grass and trees

Are all my facoitre treats.

Omnivore, Omnivore

Eating plants and meat

Oh' what fun it is to munch

And chew up all my lunch.

Consumer Song

Written Monica Abarca
(To the tune of "Jingle Bells")

Carnivore, Carnivore

Eating all the meat,

Oh'watch out for my sharp teeth

I'll eat you, head to feet.

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Leaves and lettuce, grass and trees

Are all my facoitre treats.

Omnivore, Omnivore

Eating plants and meat

Oh' what fun it is to munch

And chew up all my lunch.

Note Sheet Flip Book

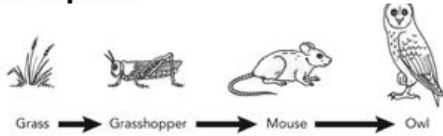
For Printing Purposes:

The first page is the outside of the flip book and students will fill in the words. The second page will be folded in half, so the opposite side of the examples are the vocabulary terms from the first page. You only need to print the second page, and precut the example flaps so the students just need to write the terms on the outside. Have the students write the

Example:	is the _____ of food _____ from one organism to another in an ecosystem 1
Example:	is an _____ food chains with different pathways for the flow of food energy in an ecosystem 2
Example:	is an organism that can make its _____ food by using energy from its _____ 3
Example:	are animals that eats _____ or plant products (primary consumer) 4
Example:	are animals that eats other _____ 5
Example:	are animals that eats _____ plants and animals 6
Example:	are organisms that gets energy by feeding on _____ materials and wastes

MEMORANDUM

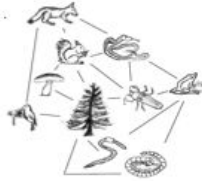
Example:



is the path of food energy from one organism to another in an ecosystem

1

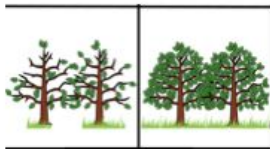
Example:



is an overlapping food chains with different pathways for the flow of food energy in an ecosystem

2

Example:



is an organism that can make its own food by using energy from its surroundings

3

Example:



are animals that eats only plants or plant products (primary consumer)

4

Example:



are animals that eats other animals

5

Example:



are animals that eats both plants and animals

6

Example:



are organisms that gets energy by feeding on dead materials and wastes

7

food chain

1

food web

2

producer

3

herbivore

4

carnivore

5

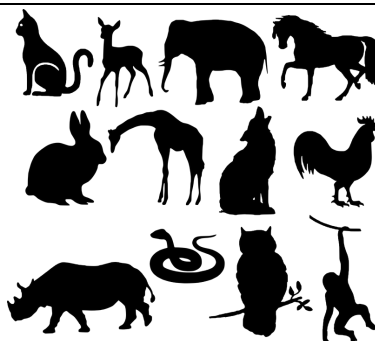
omnivore

6

decomposer

7

Lesson 18: Living Organisms I Review



Goal/Purpose: To allow the students to use and review vocabulary in a fun way.

Objectives: Learners will be able to review terminology from the week in both a visual poster and by utilizing the terms to win various games.

Materials: N/A

Prep-Work: N/A *Teachers can write the jeopardy planning board on the chalkboard, allowing space for team names to be added so scores can be tallied and shown to the class. Also come up with brief backup questions for other games including Race to the Board, or create flashcards for Heads Up.*

Energizer 10 mins): Have students share their food chain mobiles they created the day before. *Make sure one student from each table has a chance to share.*

Key Vocabulary: All vocabulary from Week 4

Adaptation - A body part, body covering, or behavior that helps an animal survive in its environment. *Change to: something special about an animal or plant that helps it survive in its environment.*

Structural Adaptation - Physical features of the plant or animal

Behavioral Adaptation - The actions of a plant or animal takes to survive in the environment

Camouflage - A color or shape in an animal's body covering that helps it blend into its environment.

Life Cycle - Stages of life from birth to death

Egg Stage - First stage of the life cycle: Small round eggs are laid on leaves

Caterpillar - Second stage in the life cycle: Egg hatches into a larva/caterpillar

Chrysalis - The larvae/caterpillar creates this structure around itself and while inside of it, transforms into a butterfly

Adult Stage - When the butterfly hatches from its chrysalis, it becomes time to mate and find a place to lay eggs

Metamorphosis - Transformation from a young form to an adult form in multiple stages

Food Chain - Is the path of food energy from one organism to another in an ecosystem

Food Web - Is an overlapping food chains with different pathways for the flow of food energy in an ecosystem

Producer - Is an organism that can make its own food by using energy from its surroundings

Consumer - Is an organism that eats other organisms or organic matter

Decomposer - Are organisms that gets energy by feeding on dead materials and wastes

Predator - Are wild animals that hunt, or prey on, other animals

Prey - An organism that is killed and eaten by another organism

Herbivores - Are animals that eats only plants or plant products (primary consumer)

Carnivores - Are animals that eats other animals

Omnivores - Are animals that eats both plants and animals

Decomposers - Are organisms that gets energy by feeding on dead materials and wastes

Activity (50 mins): It is up to the teachers discretion what game to play, depending on time, class's attention, and class behavior. Note: Students may have never heard the games before and will need examples and instructions before starting. *Teachers can also use the discussion cards or any other worksheet or activity that they did not have time to get to during the lesson this week and use it as review. Teachers can also pull from previous weeks games and vocabulary to ensure all terminology is being reviewed; this is good for challenge questions, catching some students off guard.*

Heads-Up: You can play as a whole class, in two groups or at each table. Vocabulary words are written on an index card and placed face down. One person is "it" and picks up one of the index cards and puts it directly on top of their forehead, making sure they do not see the word but everyone on the team sees it. Their team then tries to act or describe out loud the word on the person's forehead and the person who is "it" guesses until they get it right, when they do they go to the next card and continue to see how many they can guess correctly in a set amount of time (often 2 minutes). The number of cards guessed correctly is then tallied under their team's name and it goes to the next team. The goal is have the most number of cards guessed correctly by the end. If playing as a whole class, each person tallies their own card count trying to have the most. *If vocabulary cards are not created before the start of class, simply hand out one index card or piece of paper to each student and ask them to all write down one vocabulary word. Then you have an instant 30 vocabulary cards and it is okay to have repeats.*

Game Show (i.e. Jeopardy): Draw a game board on the chalkboard, choosing categories based on the topics this week you want to review. When a student chooses "Food for 200" simply glance through your notes for an easier question. "Energy for 2000"? Just ask a harder question. Some already created games, teachers can use for questions are:

Food Chain: <https://jeopardylabs.com/play/food-chains-food-webs>

Adaptations: <https://jeopardylabs.com/play/biome-jeopardy39>

Butterfly Life Cycle: <https://jeopardylabs.com/play/the-life-cycle-of-a-butterfly>

The game continues until all category questions have been answered, tally the points at the end to see the winning team.

Around the World: This classic individual game still works so well! The first two students pair off against each other. You ask a question, and whoever shouts the answer first wins. The winner stands and moves to the next contestant. The goal is to move as many seats as possible before losing, at which point the losing student sits in the seat of the person who bested him. The game ideally continues until one student makes it “around the world” and gets all the way back to his own seat. Often, though, the game simply ends when time is up, and the person who traveled the farthest wins. One can focus on spelling as well. Just ask “Spell consumer.” or “Spell the type of consumer you are.” (these are two varying level of questions asking the same thing, so you can make it more challenging for the older students.

Debrief/Recap (5 mins): Ask the students if they had fun today. By a raise of hands what was their favorite game? *So it can be noted for the next review session.*

Lesson Plan for Next day: Starting next section on Living Organisms - Human Body

Future Lessons: Human Body Systems

Sources:

Game Ideas: <https://teach4theheart.com/7-review-games-that-wont-waste-your-time/>

Jeopardy Games: <https://jeopardylabs.com/>

Work Cited (Citations):

Sources in Alphabetical Order:

Johnson, M. Jeopardy labs. Retrieved from <https://jeopardylabs.com/>

Kardamis, L. 7 review games that won't waste your time. Retrieved from

<https://teach4theheart.com/7-review-games-that-wont-waste-your-time/>

Photos in Order of Appearance:

Mohamed_hassan.(2017). Animal Silhouettes [Online Image] Retrieved from

<https://www.goodfreephotos.com/vector-images/kawaii-earth-vector-clipart.png.php>

Feedback: Due to the food chain mobile project taking longer than expected, we did not get to this lesson and instead used the time to finish biome posters from the week prior and their food chains.

Lesson 19: The Skeletal System



Objectives: Learners will be able to label important structures of the human body and understand the importance of the skeletal system.

Standards Covering: (*Taken from Namibian Syllabi*)

Standard 1 Identify the structures of the human skeleton

Standard 2 Explain how the skeleton acts as a support system of the body

Standard 3 Identify parts of the body protected by the skeleton

Materials: Printouts, rulers, and tape measures.

Prep-Work: Print worksheets.

Energizer (5 mins): Play song and encourage the students to dance!

Dem Bones From © *Songs for Teaching*TM

Dem bones, dem bones, dem dry bones,
Dem bones, dem bones, dem dry bones,
Dem bones, dem bones, dem dry bones,
Now shake dem skeleton bones!

The toe bone's connected to the foot bone,
The foot bone's connected to the ankle bone,
The ankle bone's connected to the leg bone,
Now shake dem skeleton bones!

The leg bone's connected to the knee bone,
The knee bone's connected to the thigh bone,

The thigh bone's connected to the hip bone,
Now shake dem skeleton bones!
Dem bones, dem bones, dem dry bones,
Dem bones, dem bones, dem dry bones,
Dem bones, dem bones, dem dry bones,
Now shake dem skeleton bones!

The hip bone's connected to the back bone
The back bone's connected to the neck bone,
The neck bone's connected to the head bone,
Now shake dem skeleton bones!

Key Vocabulary:

Skeleton - The bones of a human or animal as a whole

Skeletal System - A body system made up of the skeleton that forms the shape of the body and protects the internal organs

Skull - Structure that protects the brain

Rib Cage - A curved bony cage that protects the heart, lungs, and liver

Pelvis - Bone that protects the intestines and bladder.

Activity (1 hour 15 mins):

1. Notes Sheet:

Have one or two students volunteer to read aloud the short description at the top of the note sheet. Then, have the students use the reading to write down the two key functions of the skeletal system in the body. The purpose of this exercise is to have the learners practice reading and summarizing what they've read, which is one area in which we've seen our learners struggle.

The first key function is supporting the body.

Ask a student to stand up and act as if they didn't have bones. Then ask what kind of animals we would be like if we didn't have a skeleton. Explain how we have muscles attached to every bone and bones and muscles work together to allow us to move. Ask the students what would we no longer be able to do if we didn't have a skeleton

The second key function is protecting organs in the body.

Ask who's ever headed the ball in soccer practice or in a soccer game. Now what would happen if you didn't have a skull? The ball would hit your brain. Do you think that would hurt it? Yeah, the brain is really soft and a soccer ball hitting it would cause a lot of damage. This is why the bones are so important. They allow us to do daily tasks without injuring our important organs.

Ask who knows what the hips protect. Ask who knows another name for the hips. Tell them to look on their labelled diagram on the note sheet if they need help. The hips protect the digestive organs. Ask who knows what the skull protects. Tell the students that the brain acts as a natural helmet. Ask what the rib cage protects. The rib cage protects both the lungs and the heart at the same time. There are 12 ribs that make up the rib cage.

2. Measuring Bones There are different levels of this worksheet for 7th graders vs. the 6th & 5th graders, so have them split up into tables by grade so that they can work on the same worksheets together. The grade 7 worksheet requires them to convert the centimeter measurements to meters.

Instructions: The activity we're doing today is measuring our bones. On your note sheets, you have a labelled skeleton which you can use as a guide. The measurement chart has the common name of bones in the first column, then it has the scientific name of the bones, which you can find on the labeled skeleton. The third column tells you exactly where to measure to and from. For example, when it asks you to measure your ribs, it tells you to measure from your left chest to your right chest. *Demonstrate where you would measure from.* Then, you will use measuring tools to record the length of the bone in cm. 7th graders, you will then be required to convert the centimeter measurement into meters. Once you've finished all of the measurements, there are some questions at the bottom of the sheet that you can work on.

3. Classroom Bone Activity (Recap)

Debrief/Recap (5 mins): Ask students what bones are new that they learned about? Ask two students to stand up and say the main functions of the skeletal system in the body.

Lesson Plan for Next day: Circulatory System

Future Lessons: Respiratory System, Digestive System

Sources:

Classroom Bone Activity:

<http://eskeletons.org/sites/eskeletons.org/files//files/resources/000646791.pdf>

Measurement Activity Adapted from Worksheets Found:

<https://teachersherpa.com/template/Skulls-Skeletons--Skills-Math-Inquiry/15e2971d-08ed-49b1-8e2c-737f04b20c96/details?authorName=Susan%20Powers&afmc=d13d79d2-aafb-46ff-a998-60c7f790ef6b>

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Energizer: <https://www.songsforteaching.com/folk/dembones.php>

Note Sheet: <http://www.virginiageorgette.com/>

https://www.google.com/search?hl=en-NA&authuser=0&tbm=isch&q=labelled+skeleton+diagram&chips=q:labeled+skeleton+diagram_g_1:simple:2y-eUpeba3U%3D&usg=AI4_-kRfz_IzN3AlMn22juaS2mLNtUu1Eg&sa=X&ved=0ahUKewj4loKjyL7hAhUyUBUIHV3CCUUQ4IYIKCgB&biw=1164&bih=626&dpr=2.2#imgrc=Omgg4Mk0ukBo_M

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diagram_g_1:simple:2y-eUpeba3U=&usg=AI4_-kRfz_IzN3AlMn22juaS2mLNtUu1Eg&sa=X&ved=0ahUKEwj4loKjyL7hAhUyUBUIHV3CCUUQ4IYIKCgB&biw=1164&bih=626&dpr=2.2#imgrc=Omgg4Mk0ukBo_M:

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measurements&tbm=isch&source=iu&ictx=1&fir=y3zqgBxrABo2pM:;IBGADTegh_4RQM,_&vet=1&usg=AI4_-kR1qSmhrR0Cg-vGUOEAdiq-8g-rYA&sa=X&ved=2ahUKEwidrayb4bjhAhXCJVAKHcqfD-4Q9QEwAnoE CAkQCA#imgrc=y3zqgBxrABo2pM:&vet=1

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Feedback: The worksheet was a breeze for the seventh graders and took the fifth graders a little longer to complete. Learners still struggled with reading a passage and summarizing what they read. The matching was a little too easy for all of the students and didn't challenge them much.

The common name of bones should be reworked on the measurement worksheet. Maybe instead of listing the common name and the scientific name of bones on the sheet, we could've listed the scientific name and then had the students write the common name. This would've encouraged the students to use their labeled diagrams and connect the scientific names (ie pelvises) to the common names (hips). Having two different worksheets for grade 7 and grades 5 and 6 was definitely a good move. The 7th graders had more bones to measure and more difficult questions at the end of the worksheet. This worked out well because they were challenged a little more. Both worksheets seemed to be at the appropriate level and most learners completed the worksheets around the same time. We recommend using this tactic to cater to all grades when possible.

The large skeleton diagram did not print yesterday so we couldn't complete that activity. This cut the lesson very short and we had a lot of time to fill (at least 30 minutes). It would've been nice to have the full skeleton diagram to continue the lesson, but we just had students finish up other work from previous days.

The Skeletal System



The skeletal system forms the structure of our human bodies. This system has two main functions. First, bones support the whole body. Without bones, we wouldn't be able to stand or walk or dance. Second, bones protect our organs. For example, our skulls act like a helmet for our brains.



Without bones we would look like blobs. Yikes!

Summarize: key functions of the skeletal system

- 1.
- 2.

Match the bone to the organ that it protects.



Hips



Skull



Rib cage



Brain



Lungs

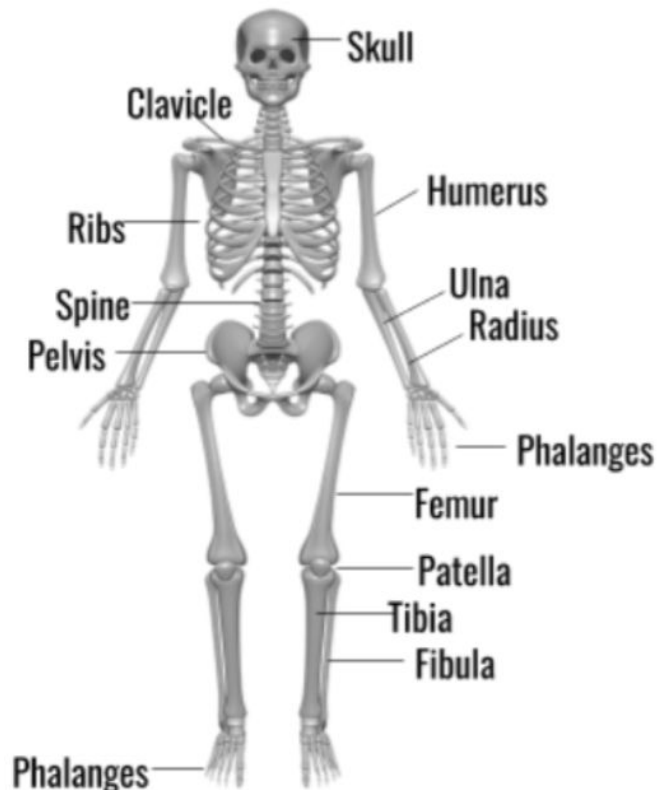


Digestive organs



Heart

Main bones in the skeleton





The Skeletal System **MEMORANDUM**

The skeletal system forms the structure of our human bodies. This system has two main functions. First, bones support the whole body. Without bones, we wouldn't be able to stand or walk or dance. Second, bones protect our organs. For example, our skulls act like a helmet for our brains.

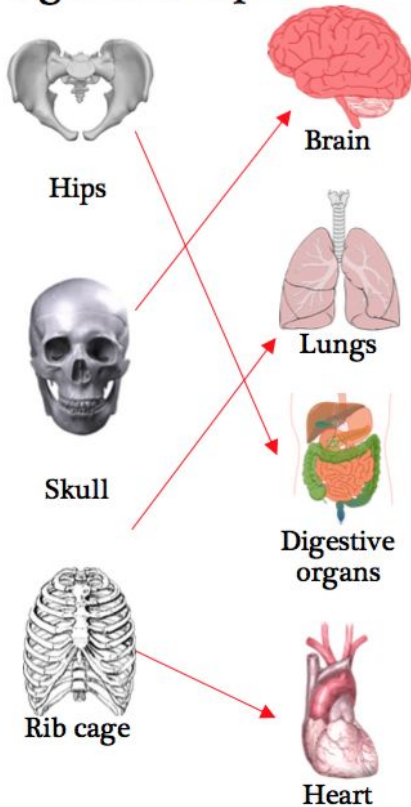


Without bones we would look like blobs. Yikes!

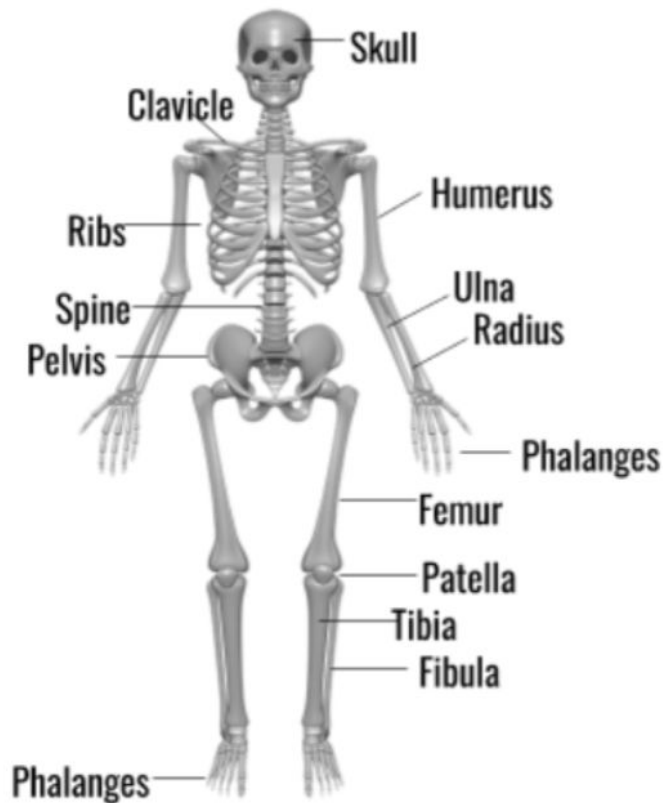
Summarize: key functions of the skeletal system

1. **Support the body**
2. **Protect important organs**

Match the bone to the organ that it protects.



Main bones in the skeleton



Seventh Grade Worksheet

Skeleton Measurements



Scientists use **maths** to gather information about skeletons. Work in partners and use rulers or tape measures to gather information about your skeleton.

Part of Skeleton to measure		Where do I measure to and from?	Measurement in centimeter (cm)	Measurement in meters (m)
Common Name	Scientific Name			
Head	Skull	Top of head to base of head		
Clavicle	Collar bone	Left shoulder to right shoulder		
Ribs	Rib cage	Left chest to right chest		
Back	Spine	Base of skull to tail bone		
Hips	Pelvis	Left hip to right hip		
Thigh bone	Femur	Right hip to right knee		
Knee	Patella	Top of knee to bottom of knee		
Shin bone	Fibula/Tibia	Right knee to right ankle		
Foot	Metatarsals and phalanges	Heel to big toe		
Hand	Metacarpals & phalanges	Wrist to middle finger		
Arm	Humerus & ulna	Shoulder to wrist		

Think!

Using the data that you collected, calculate your approximate height.

My approximate height = skull + spine + femur + patella + fibula/tibia

My approximate height = _____ cm

Now measure your actual height using a measuring tool.

My actual height = _____ cm

Fifth and Sixth Grade Worksheet

Skeleton Measurements



Scientists use **maths** to gather information about skeletons. Work in partners and use rulers or tape measures to gather information about your skeleton.

Part of Skeleton to measure		Where do I measure to and from?	Measurement in centimeter (cm)
Common Name	Scientific Name		
Head	Skull	Top of head to base of head	
Clavicle	Collar bone	Left shoulder to right shoulder	
Ribs	Rib cage	Left chest to right chest	
Back	Spine	Base of skull to tail bone	
Hips	Pelvis	Left hip to right hip	
Thigh bone	Femur	Right hip to right knee	
Knee	Patella	Top of knee to bottom of knee	
Shin bone	Fibula/Tibia	Right knee to right ankle	
Arm	Humerus & ulna	Shoulder to wrist	

Think!

What's the longest bone you measured? _____.

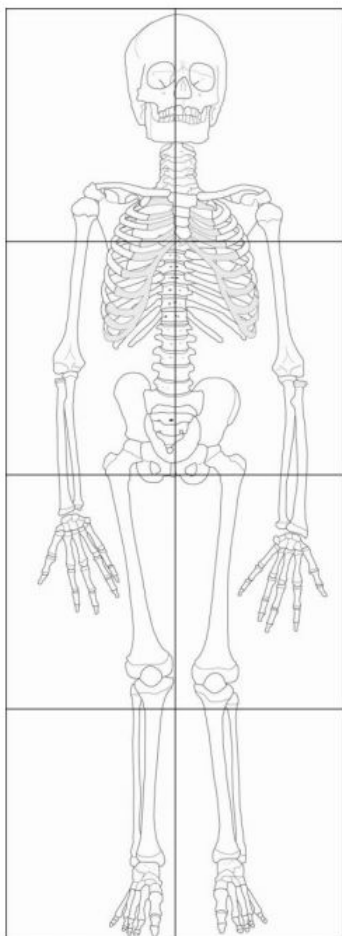
What's the shortest bone you measured? _____.

Now measure your actual height using a measuring tool.

My total height = _____ cm

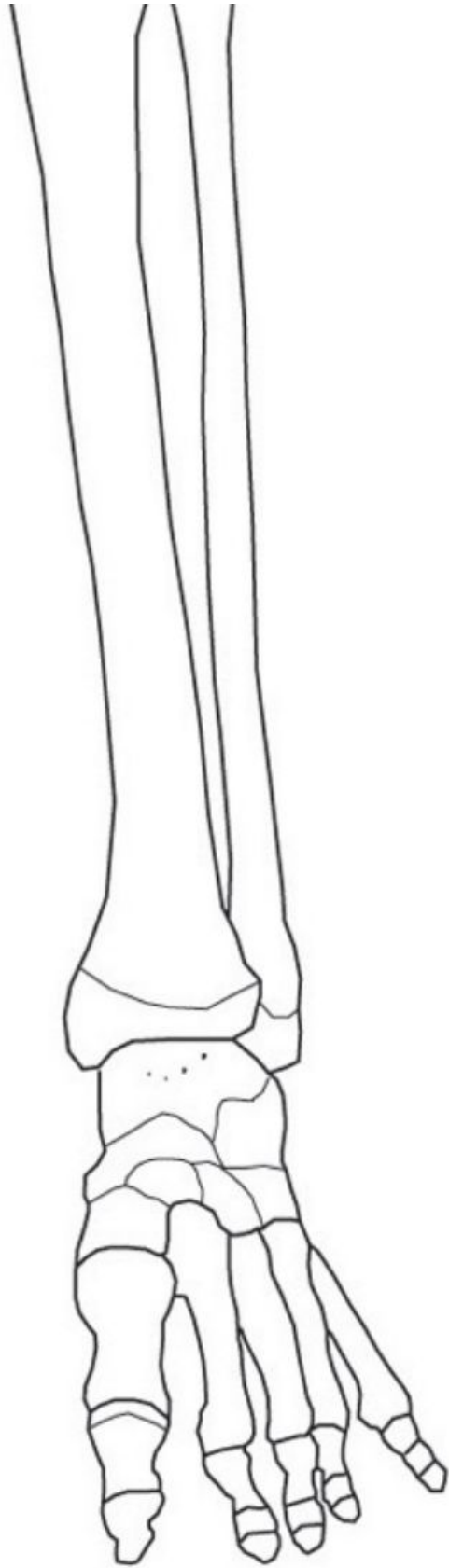
Understanding the human skeleton is important for learning about human and non-human primate anatomy. Some of the defining characteristics for modern humans include our height and our skeletal adaptations for bipedalism. This printout will help you learn about the human skeleton and identify some of the important features of our skeletal anatomy.

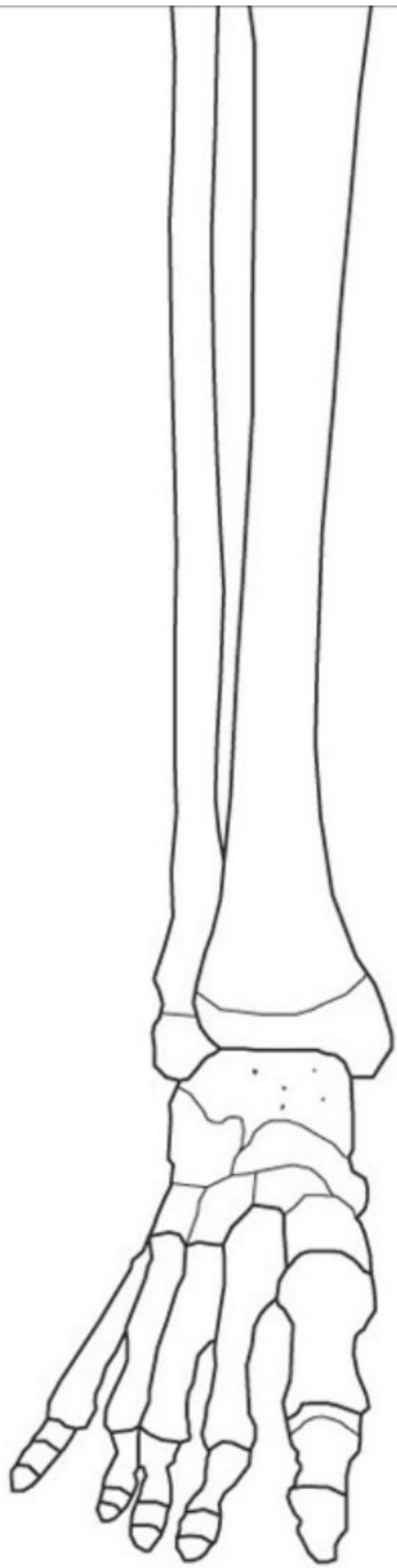
This document contains an outline of a juvenile human standing 109 cm tall (or 43" tall). Modern humans average a height of 109 cm between 5 and 6 years of age. To compare, the average height for a modern human adult female is 162 centimeters (or 5'3") tall. An adult male today usually stands about 175 centimeters (5'7") tall.

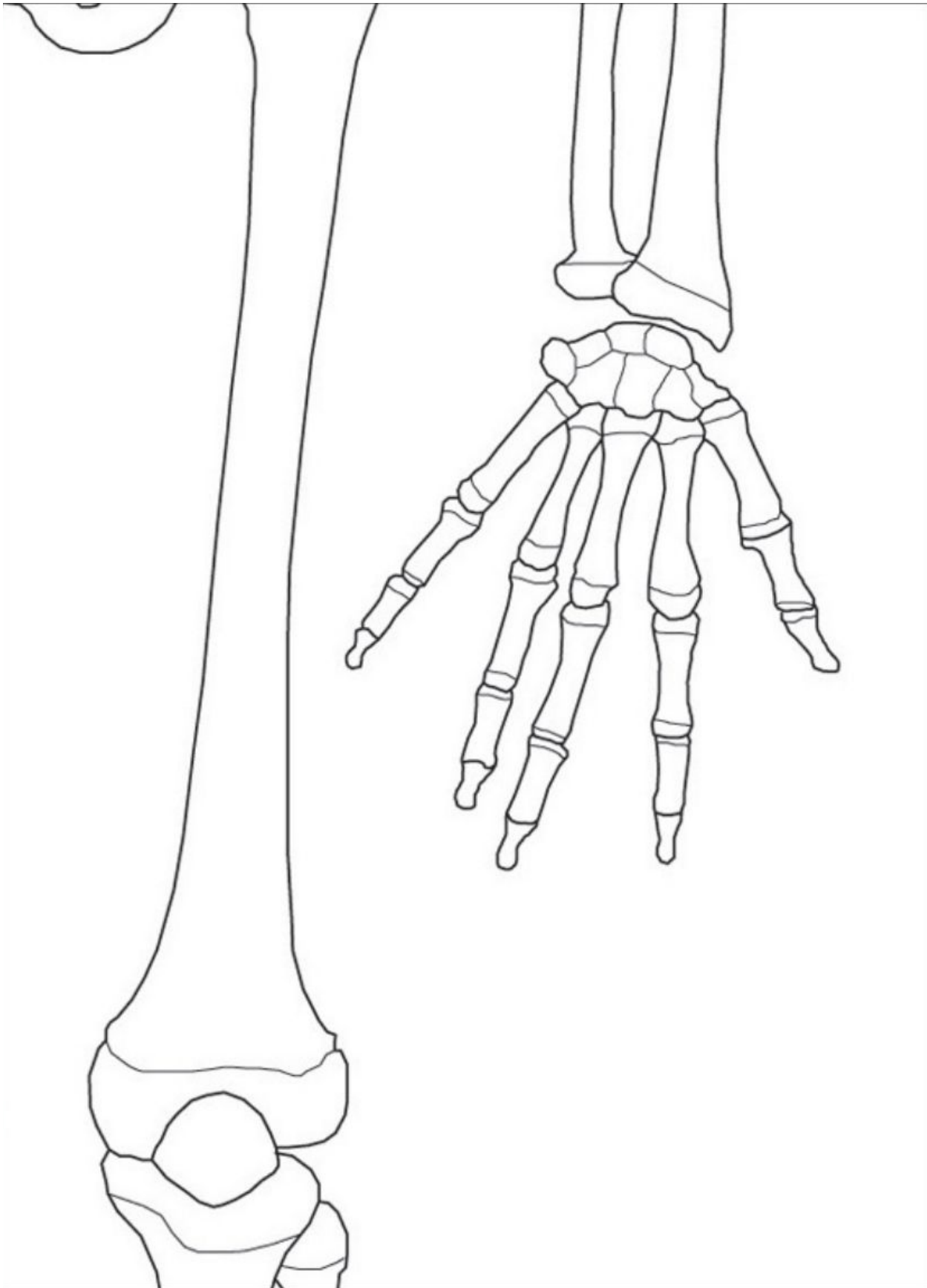


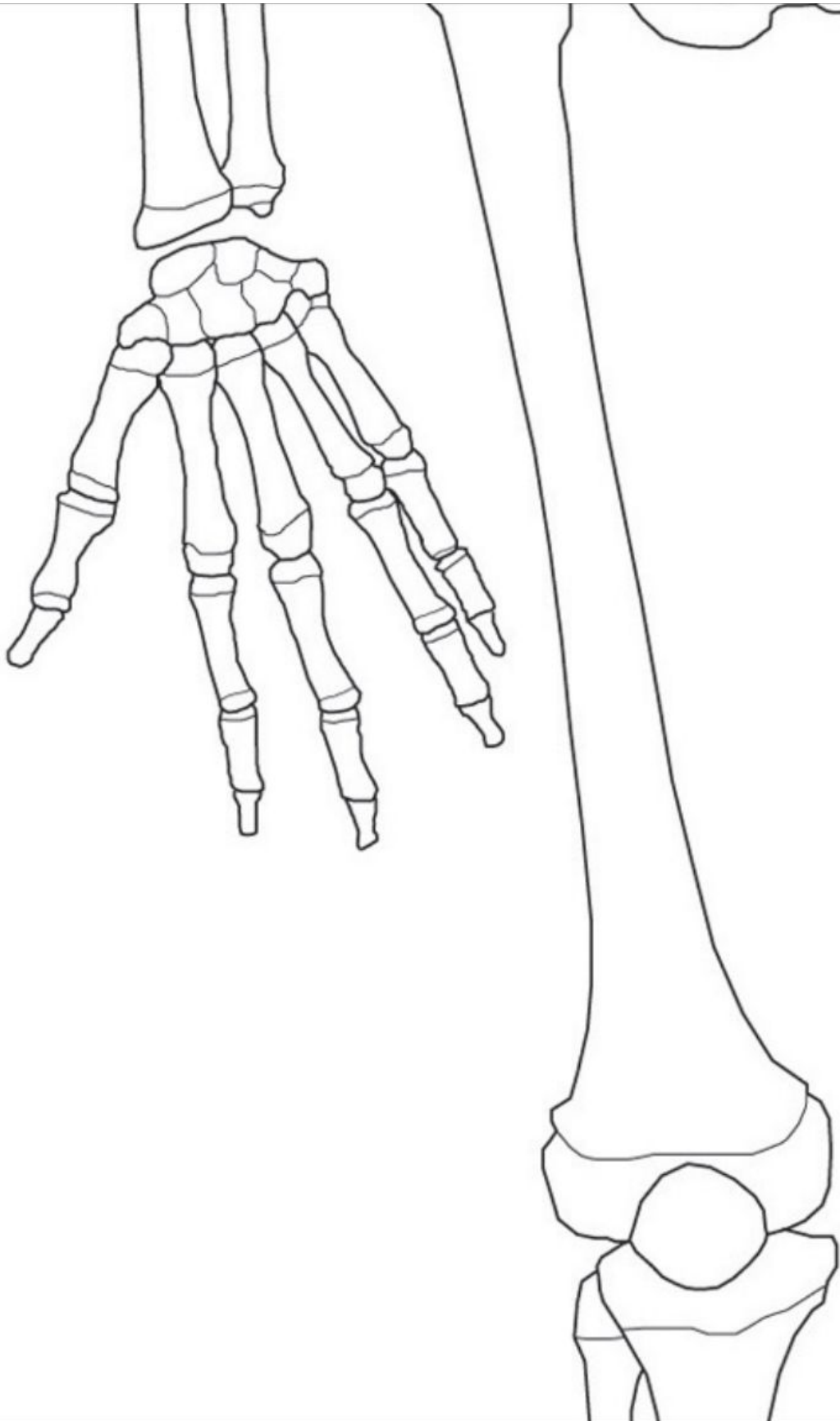
Instructions for Printing Life Size Printout:

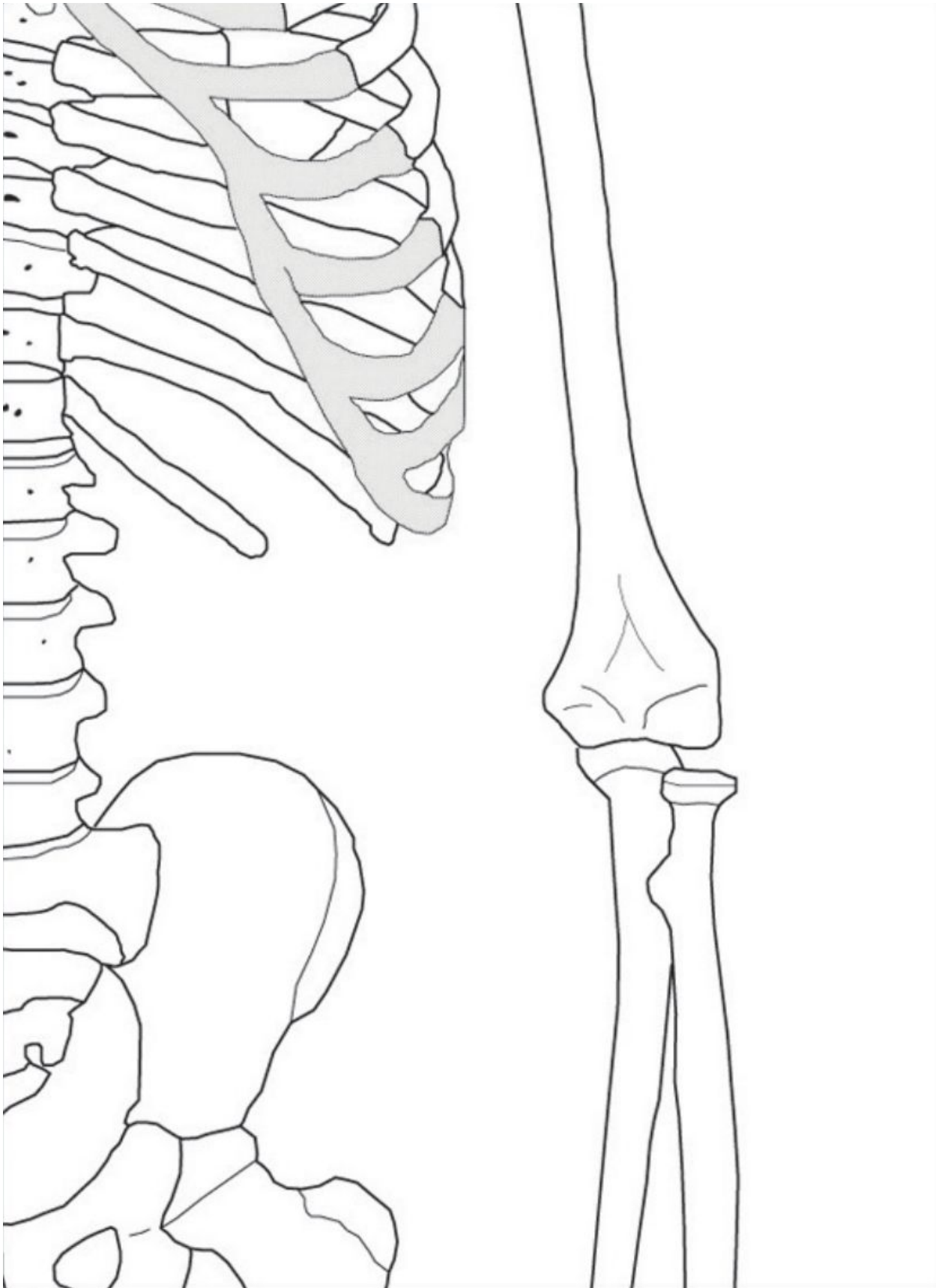
1. Print pages 3 through 10 of this document on standard 8 ½" x 11" pages (portrait).
 - Note: using a higher printing resolution will improve the quality of the images.
2. Trim the pages along the black lines provided.
3. Assemble the full picture (as illustrated to the left) on the floor or by taping on the wall, chalkboard, etc.
4. Try to identify the different bones. Remember, most of the bones in the body are paired. This means the same bone will be found on each side of the body.
5. Compare the height of the skeleton on the printout with the printout of Lucy and your own height. Think about the differences between the skeletons.
6. Have fun and learn!

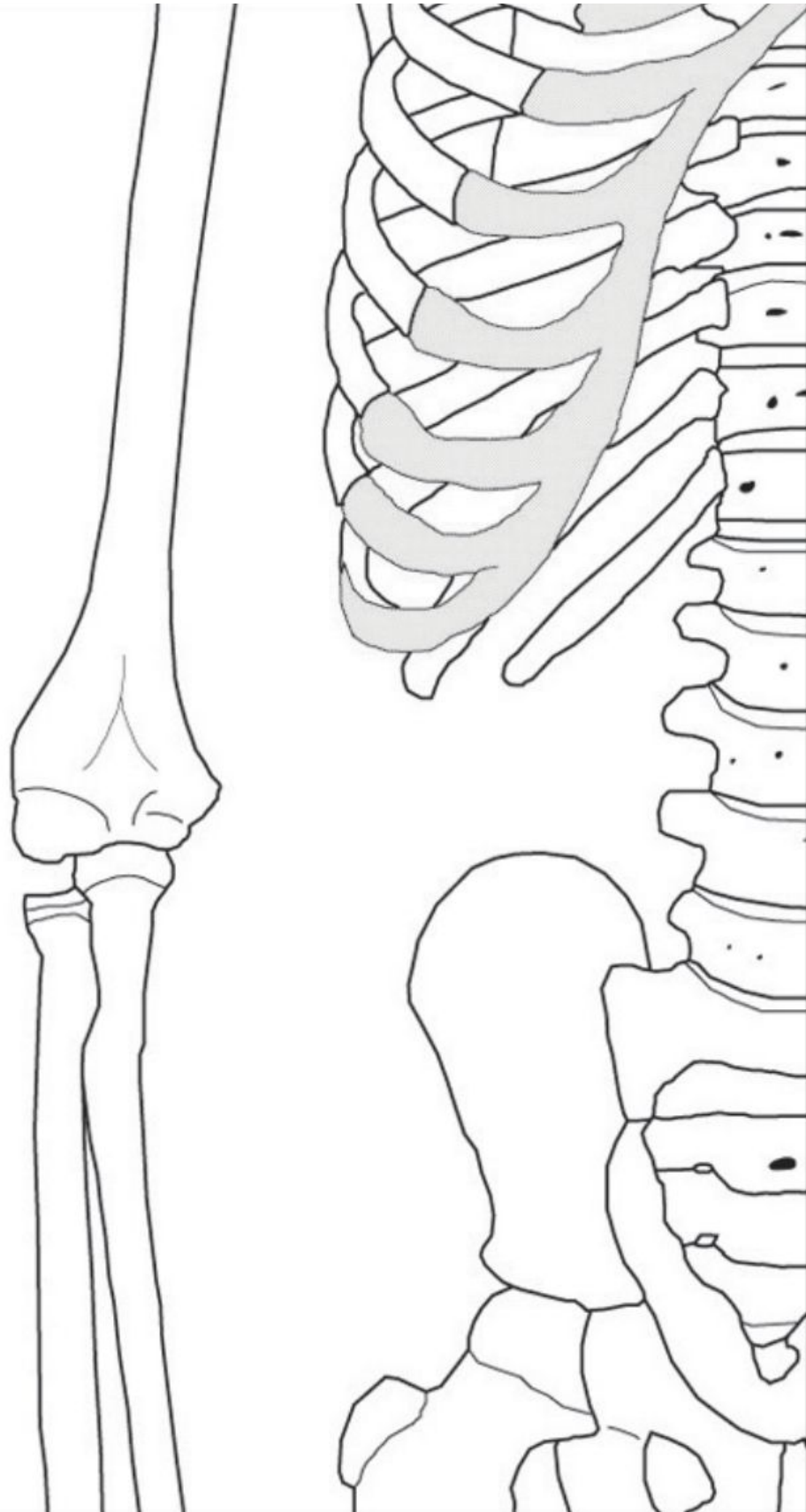


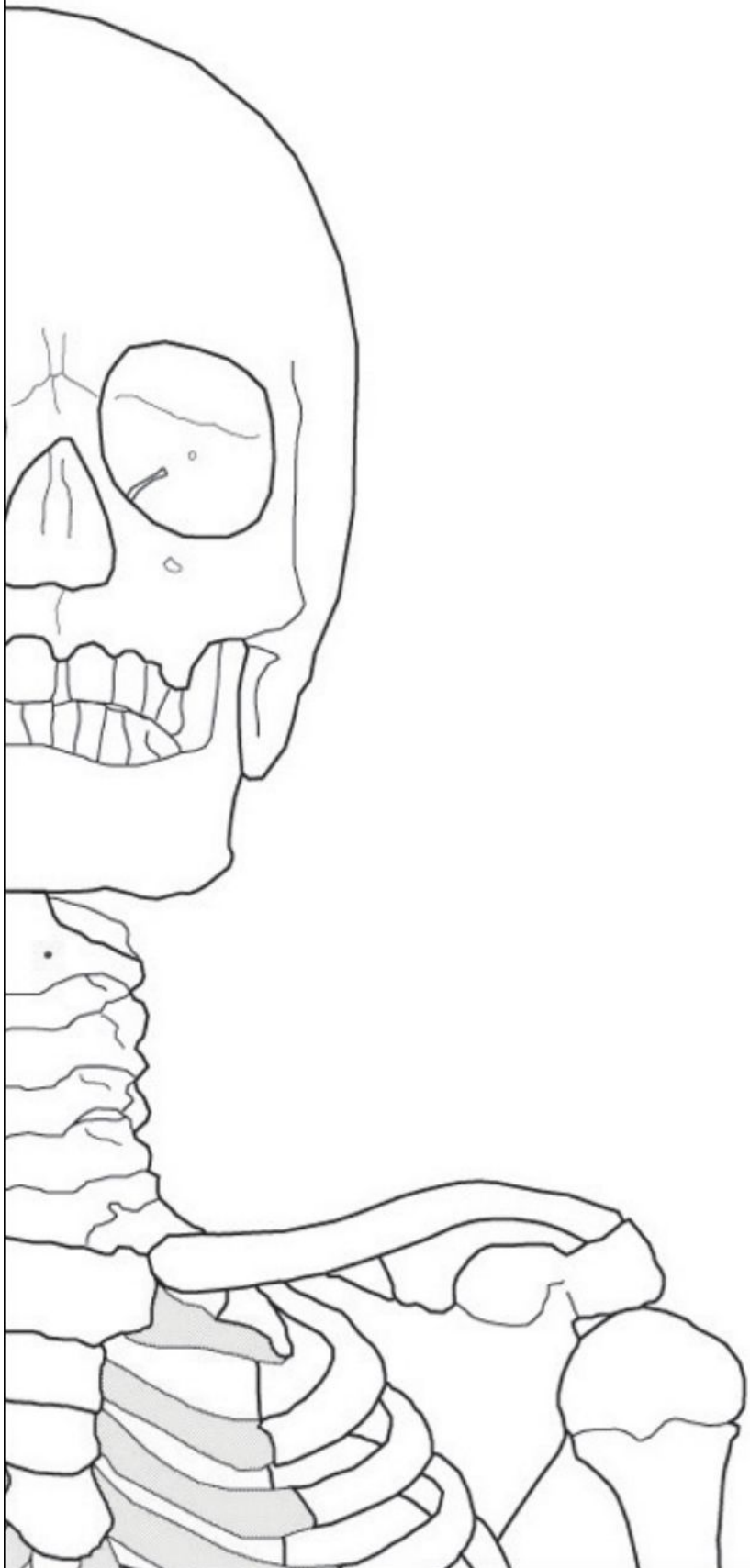


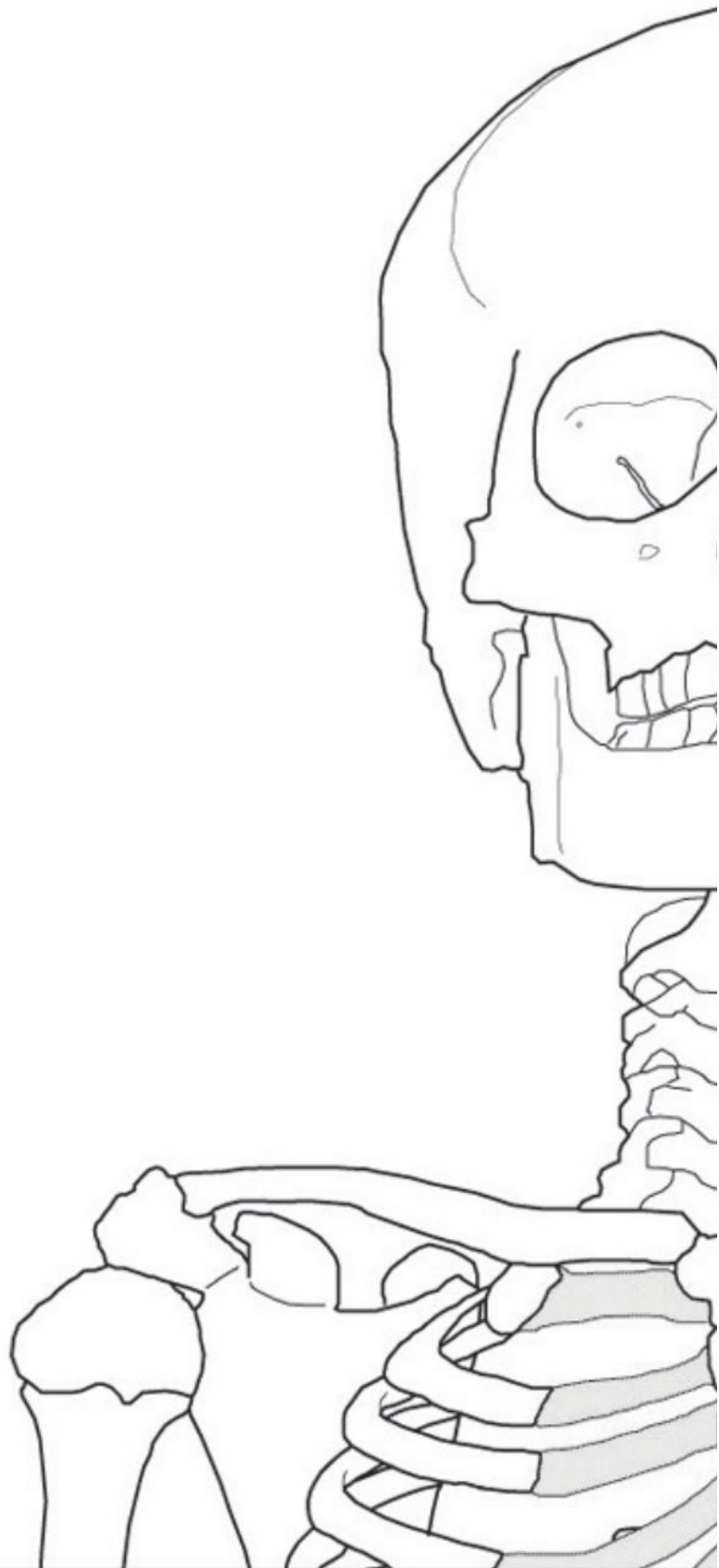




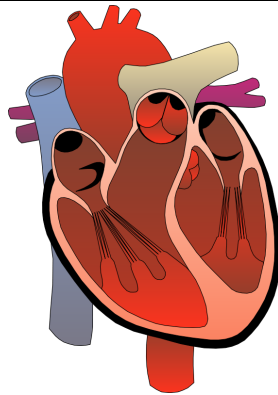








Lesson 20: Circulatory System



Objectives: Learners will be able to label the four chambers of the heart, describe the direction of blood flow, measure their pulse, and understand that the main function of the circulatory system is to pump blood throughout the entire body.

Standards Covering: *(Taken from Namibian Syllabi)*

Standard 1 Identify parts of the circulatory system.

Standard 2 Describe the basic functions of the parts of the circulatory system.

Standard 3 Describe the functions of the chambers of the heart.

Materials: 2 water bottles with nozzles, 3 balloons, 30 sheets of graph paper, rulers

Prep-Work: Fill water bottles completely with water.

Energizer (5 mins): Classroom Bone Activity

Instructions: We are going to see who remembers the bones in the body. We have a life size model of a skeleton here. I'm going to name a bone and if you know where the bone is located, I want you raise your hand. If I call on you, you'll take a marker and go up to the skeleton and label the bone. Let's see how many bones we can remember as a class!

Now ask students to identify the strongest muscle of the body. Allow students to give their ideas and then explain that the correct answer is the heart. Ask the students what the heart does?

- The heart works day and night to pump blood through the circulatory system.
- The heart consists of two pumps to do so

Transition: Today we are going to discuss the different parts of the heart and how it works. Introduce the idea that the heart is a muscle that works like a pump.

Talking Notes: (Directly taken from Your Heart and Circulatory System Reviewed by Steven Dowshen, MD)

Your heart is really a muscle. It's located a little to the left of the middle of your chest, and it's about the size of your fist. There are lots of muscles all over your body — in your arms, in your legs, in your back, even in your behind.

But the heart muscle is special because of what it does. The heart sends blood around your body. The blood provides your body with the oxygen and nutrients it needs. It also carries away waste. Your heart is sort of like a pump, or two pumps in one. The right side of your heart receives blood from the body and pumps it to the lungs. The left side of the heart does the exact opposite: It receives blood from the lungs and pumps it out to the body.

Complete the **Demo Blood Vessel**

Your body needs this steady supply of blood to keep it working right. Blood delivers oxygen to all the body's cells. To stay alive, a person needs healthy, living cells. Without oxygen, these cells would die. If that oxygen-rich blood doesn't circulate as it should, a person could die.

Hand out the Heart Diagram Note Sheet...

*The heart is made up of four different blood-filled areas, and each of these areas is called a chamber. There are two chambers on each side of the heart. One chamber is on the top and one chamber is on the bottom. The two chambers on top are called the **atria** (say: AY-tree-uh). If you're talking only about one, call it an atrium. The atria are the chambers that fill with the blood returning to the heart from the body and lungs. The heart has a left atrium and a right atrium.*

Students Label the Atria

*The two chambers on the bottom are called the **ventricles** (say: VEN-trih-kulz). The heart has a left ventricle and a right ventricle. Their job is to squirt out the blood to the body and lungs. Running down the middle of the heart is a thick wall of muscle called the septum (say: SEP-tum). The septum's job is to separate the left side and the right side of the heart.*

Students Label the Ventricles

The atria and ventricles work as a team — the atria fill with blood, then dump it into the ventricles. The ventricles then squeeze, pumping blood out of the heart. While the ventricles

are squeezing, the atria refill and get ready for the next contraction. So when the blood gets pumped, how does it know which way to go?

Well, your blood relies on four special valves inside the heart. A valve lets something in and keeps it there by closing — think of walking through a door. The door shuts behind you and keeps you from going backward.

Students Label the Valves (keep it simple and just label valves) - they are the squares.

How does the blood get to the rest of the body?

There are two types of pathways the blood flows in and out of the heart. There are arteries and veins. Arteries are blood vessels that take blood away from the heart. Arteries get smaller as they go away from the heart.

Students Label the Aorta (largest artery) and the Pulmonary Artery

The second pathway are veins; Veins are blood vessels that take blood towards the heart. Veins get bigger as they go towards the heart.

Student Label the Inferior and Superior Vena Cava and the Pulmonary Vein

Together they pump blood into your heart and out to the rest of your body. The left side of your heart sends that oxygen-rich blood out to the body. The body takes the oxygen out of the blood and uses it in your body's cells. When the cells use the oxygen, they make carbon dioxide and other stuff that gets carried away by the blood. It's like the blood delivers lunch to the cells and then has to pick up the trash.

The returning blood enters the right side of the heart. The right ventricle pumps the blood to the lungs for a little freshening up. In the lungs, carbon dioxide is removed from the blood and sent out of the body when we exhale. What's next? An inhale, of course, and a fresh breath of oxygen that can enter the blood to start the process again. And remember, it all happens in about a minute.

The younger students complete the connect the dot worksheet and the older students draw the path of blood on their own; using a blue utensil for deoxygenated and red utensil for oxygenated blood.

Diagram of the heart is labeled. *The older students can cross reference and check their blood path with those of connect the dots.* Ask for questions. Ask for volunteers to describe again the flow of the blood through the left and right side of the heart.

Key Vocabulary:

Circulatory System - The body system that moves blood around the body. The heart and all blood vessels make up the circulatory system.

Atrium - (say: AY-tree-uh) Chambers that fill with the blood returning to the heart from the body and lungs. *The heart has a left and right atria.*

Ventricle - (say: VEN-trih-kulz) Job is to squirt out the blood to the body and lungs. *The heart has a left ventricle and a right ventricle and make up the bottom chambers.*

Arteries - Blood vessels that take blood away from the heart. Arteries get smaller as they go away from the heart. *The smaller arteries that connect to the capillaries, are called arterioles. A way for students to remember is A for away like in Artery.*

Veins - Blood vessels that take blood towards the heart. Veins get bigger as they go towards the heart. *The smallest veins are called venules.*

Blood Vessels - Arteries and veins since it is what moves our blood.

Capillaries - Go between arteries and veins. *They came from the Latin word meaning hair which is tiny.*

Activity (35 mins):**I. Demo Blood Vessels** (may be done during notes):

Description for the teacher to explain: How does the heart beat? Before each beat, your heart fills with blood. Then its muscle contracts to squirt the blood along. When the heart contracts, it squeezes — try squeezing your hand into a fist. That's sort of like what your heart does so it can squirt out the blood. Your heart does this all day and all night, all the time. The heart is one hard worker!

Teacher fills a bottle (with a nozzle) full of water. Then secures a balloon over the tip. One student gently squeezes and releases the bottle so that the balloon repeatedly fills with water. Another student holds the balloon between the fingers to feel the expansion and contraction. This models expansion and contraction of blood vessels as the heart beats. The teacher can have multiple students come up and try it. *Because of limited materials we can not do this in pairs and will be a demo. If there are multiple sets then students can run the example on their own allowing the chance for more students to feel how the blood vessels are pumped.*

II. Pulse Graph: How can we measure the pumping of our hearts? Explain that it is the pulse. We can measure your pulse by you feeling when blood is pumped through the arteries, you can feel the artery walls stretch and relax.

Have students feel for a pulse with their fingers. Guide into discussion of problems that may arise by using the finger to feel pulse. Ask them to share out loud their pulse (how many beats per minute) while sitting at their chairs. *Tip: Pulse can also be measured by counting your heartbeats for 30 seconds and multiply that number by 2.* Then hand out the worksheet.

Students will now understand how to calculate the pulse and they can practice their graphing skills using this.

Teacher hands out table with various exercises for students to complete, and then calculate their heart rate for a minute. Before they start each student must make a hypothesis as to what exercise will produce the highest heart rate for them and which will have the lowest. They must wait and bring down their heart rate before starting the next exercise as to not alter the heart rate. After all exercises are complete they can make a line or a bar graph to show their results (each student will receive one piece of graph paper). The X-Axis is the exercise, the Y-Axis is the heart rate. There needs to be a title on every graph. Students who finish early need to calculate the average heart rate while exercising all of them. And older students with more graph practice should help the younger students who are less familiar. Once everyone is done allow class discussion to compare results. Ask what is the maximum (highest value) for X exercise. Minimum? Etc. Discuss why there are different heart rates (we are all different) which leads into the debrief.

III. Dramatization of the Blood's Trip Through the Heart (challenging activity, good for review if more time or another lesson):

1. Set up a large room sized diagram of the circulatory system, or use chalk
2. Students assume the roles of "body organs and parts." This should include heart, lungs, arms, legs, etc. Other students act as the "blood." As the "blood" travels from the heart to the lungs, students simulating the blood should be given several tags labeled "oxygen."
3. The "blood" then travels back to the heart and to the other parts of the body. As the "blood" travels to each body part, it exchanges "oxygen tags" for tags labeled "carbon dioxide" and "other wastes."
4. When the oxygen is used up, the "blood" then must travel back to the heart and lungs to exchange the "carbon dioxide and waste" for new "oxygen."
5. After the activity is run through a few times, so all students have been different components, pull the class together to discuss and review the movements of the activity.

Debrief/Recap (5 mins): What might occur if the heart does not function properly? *Discuss heart side effects, heart transplants. Connect to South African surgeon, Christiaan Barnard, who performed the world's first highly-publicized heart transplant and the first one in which the patient regained consciousness in December 3rd 1967 (51 years ago).*

How do you keep your heart strong? *Remember that your heart is a muscle. If you want it to be strong, you need to exercise it. By being active in a way that gets you huffing and puffing, like jumping rope, dancing, or playing basketball. Try to be active every day for at least 30 minutes! An hour would be even better for your heart!*

- *Eat a variety of healthy foods and avoid foods high in unhealthy fats, such as saturated fats and trans fats (reading food labels can help you figure out if your favorite snacks contain these unhealthy ingredients).*
- *Try to eat at least five servings of fruits and vegetables each day*
- *Avoid sugary soft drinks and fruit drinks*

Lesson Plan for Next day: Nervous System
Future Lessons: Respiratory System

Sources:

Skeleton Mapp: <http://eskeletons.org/resources>

Christiaan Barnard <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6062759/>

Heart Demo, Pulse and Drama: http://www.henry.k12.ga.us/cur/mybody/circ_lessons.htm

Vocabulary: https://kids.kiddle.co/Circulatory_system

Description of Blood Vessel Pumps and Debrief Question: <https://kidshealth.org/en/kids/heart.html>

Heart Diagram for Flow Worksheet for Older Students:

<https://www.teacherspayteachers.com/FreeDownload/Tier-23-intervention-Activity-Body-Heart-Blood-Flow-of-Circulatory-System-1158710>

Heart Diagram Connect-the-Dots:

<https://www.teacherspayteachers.com/Product/Explore-the-Circulatory-System-2740138>

Additional Fill in the Blanks:

<https://www.teacherspayteachers.com/FreeDownload/Circulatory-System-fill-in-the-blank-2135776>

Word Cited (Citations):

Sources in Alphabetical Order:

Caffeinate and Educate. (n.d.). Circulatory System (fill-in-the-blank). Retrieved April, 2019, from <https://www.teacherspayteachers.com/FreeDownload/Circulatory-System-fill-in-the-blank-2135776>

Cooper, D. K. (2018, June 30). Christiaan Barnard-The surgeon who dared: The story of the first human-to-human heart transplant. Retrieved April, 2019, from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6062759/>

Dowshen, S. (Ed.). (2018, May). Your Heart & Circulatory System (for Kids). Retrieved April, 2019, from <https://kidshealth.org/en/kids/heart.html>

Henry County Public Schools. (n.d.). Circulatory System. Retrieved April, 2019, from http://www.henry.k12.ga.us/cur/mybody/circ_lessons.htm

I., L. (n.d.). Tier 2/3 Intervention Activity Body-Heart-Blood Flow of Circulatory. Retrieved April, 2019, from <https://www.teacherspayteachers.com/FreeDownload/Tier-23-intervention-Activity-Body-Heart-Blood-Flow-of-Circulatory-System-1158710>

Kiddle Encyclopedia. (2019, April 9). Circulatory system facts for kids. Retrieved April, 2019, from https://kids.kiddle.co/Circulatory_system

Menegaz, R. A., & Kappelman, J. (n.d.). ESkeletons Life Size Printout. Retrieved from

<http://eskeletons.org/resources>

T. (n.d.). Explore the Circulatory System. Retrieved April, 2019, from

<https://www.teacherspayteachers.com/Product/Explore-the-Circulatory-System-2740138>

Photos in Order of Appearance:

ArtFavor.(2014). Medical illustration of a human heart. [Online Image] Retrieved from

<http://www.freestockphotos.biz/stockphoto/14157>

Clipart Library. (n.d). Heart Diagram Unlabeled. [Online Image] Retrieved from

<http://clipart-library.com/clipart/piq4je7i9.htm>

Feedback: Due to no water, P.A.Y. closed early and this lesson was not taught by WPI.

The Circulatory System Note Sheet

Name: _____

Date: _____

The Circulatory System

Circulatory System is the body system that moves _____ around the body. It is made up of the heart and all blood vessels.

Chambers of the heart:

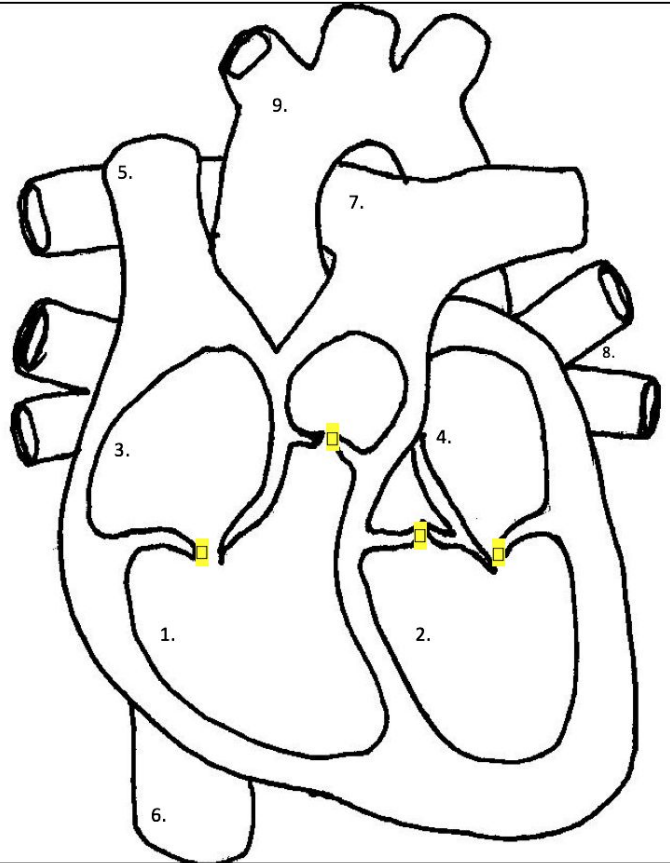
- **Ventricle** (say: VEN-trih-kulz) are chambers that squirt _____ the blood to the body and lungs.
- **Atrium** (say: AY-tree-uh) are chambers that fill with the blood _____ to the heart from the body and lungs.

Pathways out and into the heart:

- **Arteries** are blood vessels that take blood _____ from the heart. Arteries get _____ as they go away from the heart.
- **Veins** are blood vessels that take blood _____ the heart. Veins get _____ as they go towards the heart.
- **Blood Vessels** are _____ and _____ since it is what moves our blood.
- **Capillaries** go _____ arteries and veins.

Blood Flow:

heart → _____ → capillary → _____ → heart



MEMORANDUM

Name: _____

Date: _____

The Circulatory System

Circulatory System is the body system that moves blood around the body. It is made up of the heart and all blood vessels

4 Chambers of the Heart:

Ventricle (say: VEN-trih-kulz) are chambers that squirt out the blood to the body and lungs.

Atrium (say: AY-tree-uh) are chambers that fill with the blood returning to the heart from the body and lungs.

Pathways out of and into the Heart:

Arteries are blood vessels that take blood away from the heart. Arteries get smaller as they go away from the heart.

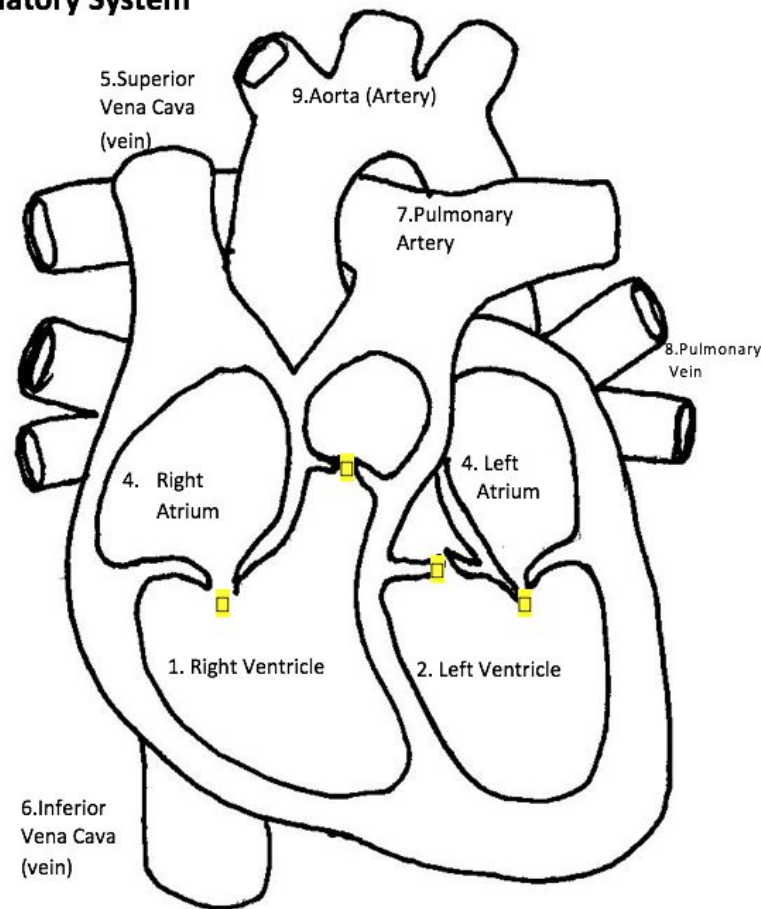
Veins are blood vessels that take blood towards the heart. Veins get bigger as they go towards the heart.

Blood Vessels are arteries and veins since it is what moves our blood.

Capillaries go between arteries and veins.

Blood Flow:

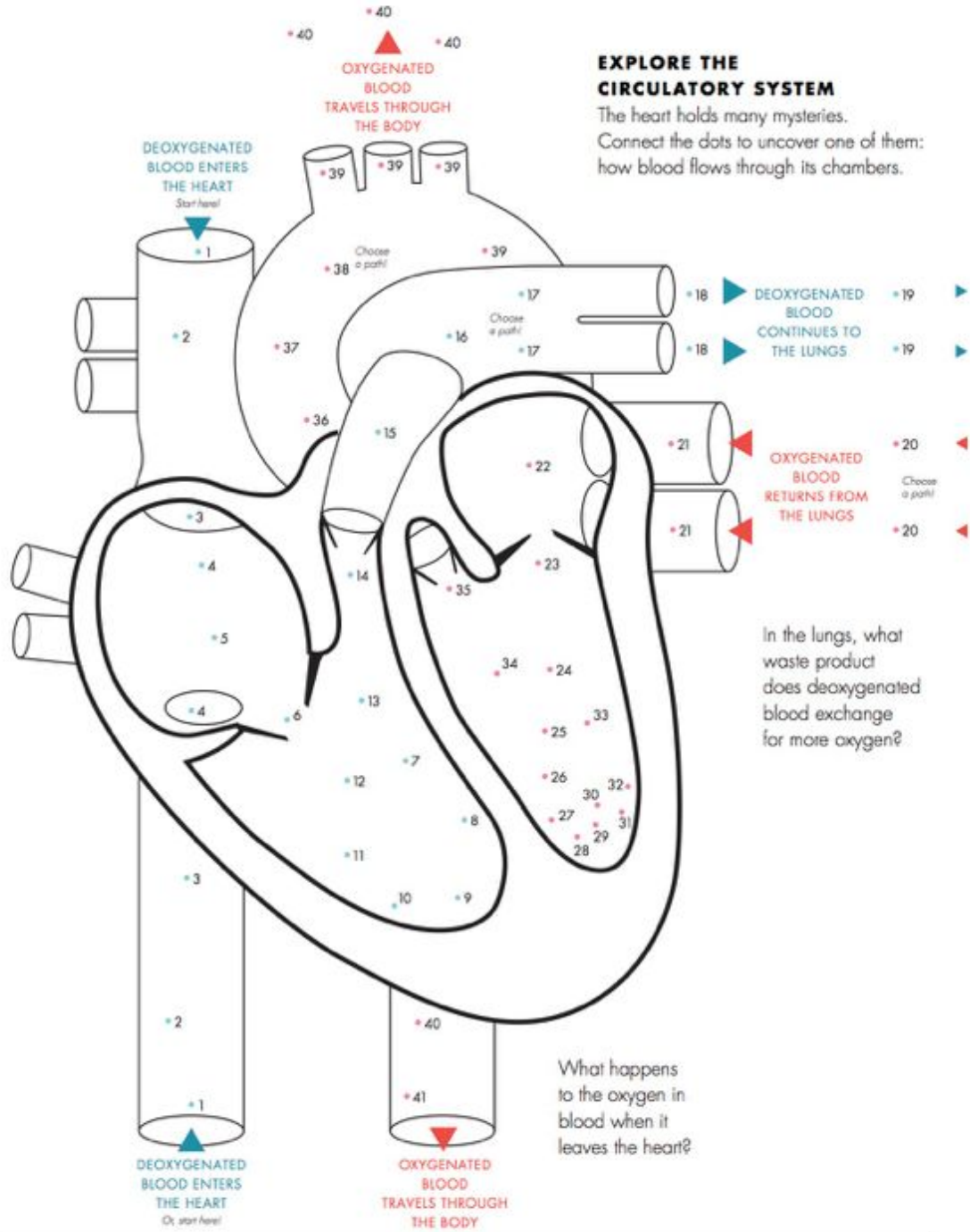
heart → artery → capillary → vein → heart



Connect-the-Dots Blood Flow Worksheet (5th and 6th Grade)

Name: _____

Date: _____



Ask a parent to take a picture and share!
#tinybop

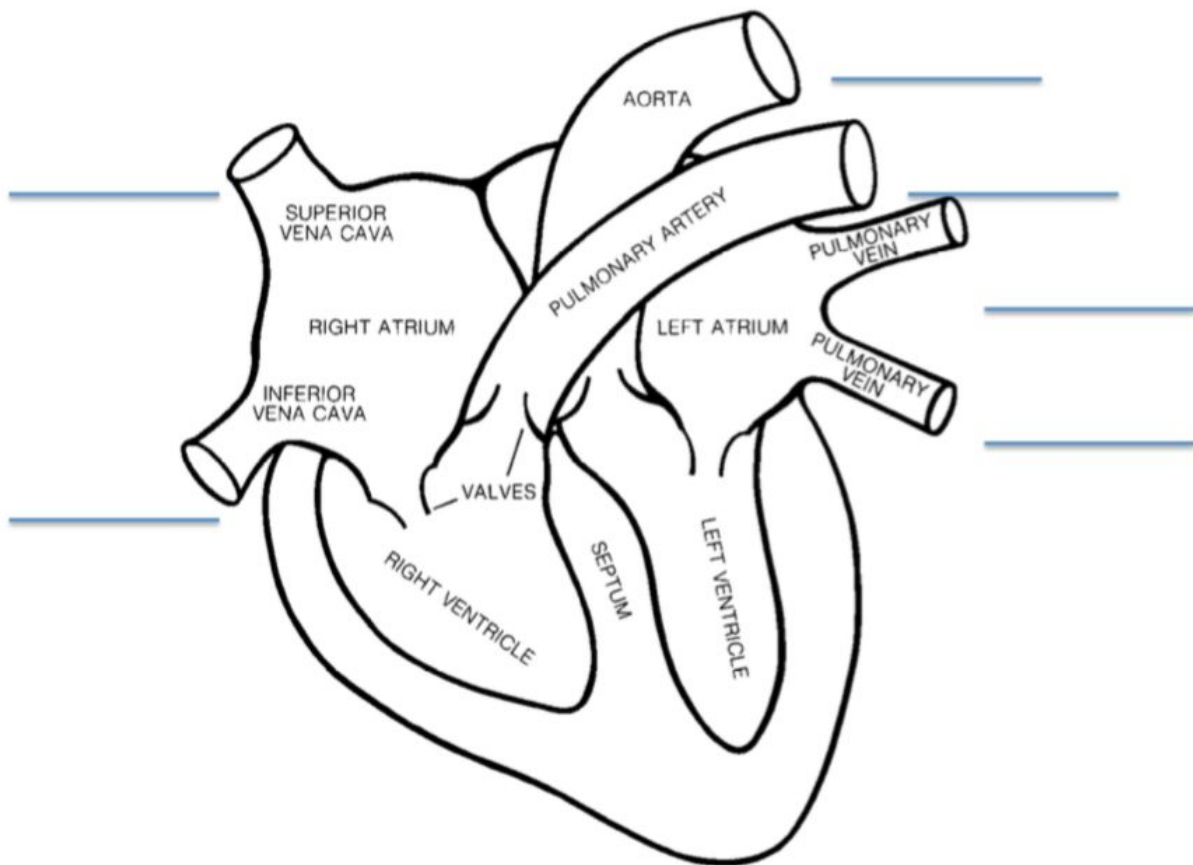


THE HUMAN BODY

Draw in Blood Flow Worksheet (7th Grade)

BLOOD FLOW

NAME: _____



When the heart pumps blood into the lungs it is Bluish in color because it is deoxygenated. (lacks oxygen)

The moment oxygen touches the blood it becomes RED.

The blood flowing back from the lungs into the heart rich in oxygen it's color is RED

The blood that flows from the heart to the body is rich in oxygen it is RED

The blood that travels into the heart from the body is Blue.

It has changed color because the blood had fed the body with all the oxygen it had collected from the lungs.

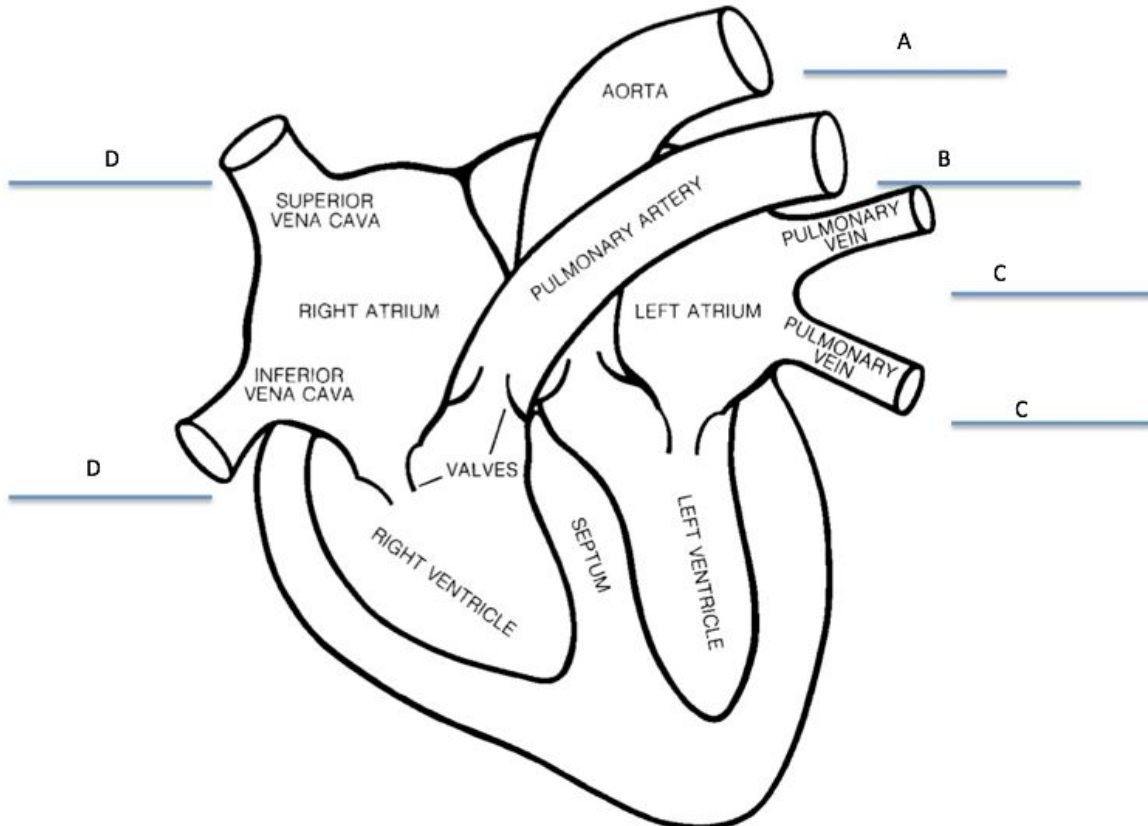
Following use Red and Blue color markers to represent the blood as it flows through the chambers of the heart. On the blank lines (_____) above label the direction of the blood flow using...

- A. Exiting the Heart flowing to the Body
- B. Exiting the Heart Flowing to the Lungs
- C. Flowing from the Lungs and Entering the Heart.
- D. Flowing from Body and Entering the Heart .

MEMORANDUM

BLOOD FLOW

NAME: _____



When the heart pumps blood into the lungs it is Bluish in color because it is deoxygenated. (lacks oxygen)

The moment oxygen touches the blood it becomes RED.

The blood flowing back from the lungs into the heart rich in oxygen it's color is RED

The blood that flows from the heart to the body is rich in oxygen it is RED

The blood that travels into the heart from the body is Blue.

It has changed color because the blood had fed the body with all the oxygen it had collected from the lungs.

Following use Red and Blue color markers to represent the blood as it flows through the chambers of the heart. On the blank lines (_____) above label the direction of the blood flow using...

- A. Exiting the Heart flowing to the Body
- B. Exiting the Heart Flowing to the Lungs
- C. Flowing from the Lungs and Entering the Heart.
- D. Flowing from Body and Entering the Heart .

Name: _____

Date: _____

Pulse Tracking Sheet

1. **Create your hypothesis: When you will have the highest pulse (when will your heart beat the fastest)? Remember a hypothesis should follow: If _____ then _____ format.**

2. **Complete the exercise and then record your pulse in the column.** Pulse is calculated by placing your finger and pressing down slightly on your vein where you can feel the heartbeat. Count how many beats are in a minute and record in your chart. *Sitting for at least two minutes before going to the next exercise. *

Exercise	Pulse (don't forget your units)
Sitting 1	
10 jumping jacks	
Sitting 2	
10 squats	
Sitting 3	
10 push-ups	
Sitting 4	

Exercise	Pulse (don't forget your units)
10 high knees	
Sitting 5	
10 butt kicks	
Sitting 6	
10 lunges	
Sitting 7	
You pick: 10	
Sitting 8	

3. **Create a graph of your results on graph paper.** Make sure to have labels on both the X-Axis, Y-Axis, and a title for your graph. You may create a line or bar graph.

4. **Conclusion:** Was your hypothesis correct or no? Explain why/how you know.

Bonus: Calculate your average pulse for sitting down and your average pulse for exercising.

Name: _____

Date: _____

Pulse Tracking Answer Sheet

- 1. Create your hypothesis: When you will have the highest pulse (when will your heart beat the fastest)? Remember a hypothesis should follow: If _____ then _____ format.**

If I do 10 jumping jacks, then my heart rate or pulse will be the highest (answers will vary student to student but the format should be If (exercise) then my heart rate will (increase or decrease).

- 2. Complete the exercise and then record your pulse in the column.** Pulse is calculated by placing your finger and pressing down slightly on your vein where you can feel the heartbeat. Count how many beats are in a minute and record in your chart. *Sitting for at least two minutes before going to the next exercise. *

Exercise	Pulse (don't forget your units)
Sitting 1	
10 jumping jacks	<i>Students answers vary but all are beats per minute</i>
Sitting 2	
10 squats	
Sitting 3	
10 push-ups	
Sitting 4	

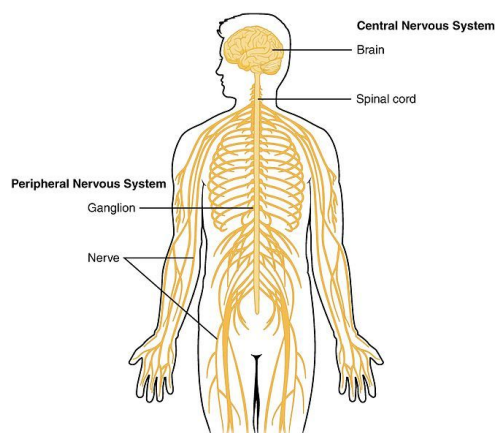
Exercise	Pulse (don't forget your units)
10 high knees	
Sitting 5	
10 butt kicks	
Sitting 6	
10 lunges	
Sitting 7	
You pick: 10	
Sitting 8	

- 3. Create a graph of your results on graph paper.** Make sure to have labels on both the X-Axis, Y-Axis, and a title for your graph. You may create a line or bar graph. *The X-Axis will be the exercise, the Y-Axis will be the heart rate and the title may be something like Heart Rate of Different Exercises.*
- 4. Conclusion:** Was your hypothesis correct or no? Explain why/how you know.

Yes, my hypothesis was correct that when I did jump jacks my heart rate was the highest. (answers will vary student to student)

Bonus: Calculate your average pulse for sitting down and your average pulse for exercising. *Students sum up all the heart rates of sitting and then divide by 8. Students sum up all the heart rates of exercises and then divide by 8.*

Lesson 21: Nervous System



Objectives: Learners will be able to label the three main components of the nervous system and explain the main function of the nervous system through discovery of their own reflexes and brain dominance activities.

Standards Covering: (Taken from Namibian Syllabi)

Standard 1: Students will be able to describe the basic functions of the nervous system

Standard 2: Students will be able to identify from a given diagram the nervous system of the human body and label the parts

Materials: Brain puzzle, rulers, station worksheet, color word sheet, brain dominance test

Prep-work: During the energizer, teacher can set up the stations

Energizer (8 mins): *Broken Telephone*

All the students gather in a circle and play broken telephone - the teacher comes up with a phrase or a sentence and whispers to the first student and then students whisper to each other one at a time all the way around the circle with the goal of the end message being the same phrase the game started with. When done the last student says aloud what they heard last and this continues backwards around the circle to see where the “telephone broke”. Depending on how long the round takes, two or three rounds can be played.

First Phrase Idea: The nervous system is made up of the brain, spinal cord, and nerves.

While the game is being played, the teacher can go around the room to set up each station. Make sure to leave papers face down so students aren't distracted from the notes when they go back to their seats. When the game is over discuss if the message was sent correctly. If it

wasn't, what happened? Explain that this is an example of how messages are sent throughout your body. Anyone know what body system sends signals? Or how/what reflexes are? If no students know, explain.

Key Vocabulary:

Nervous System - Controls everything you do, including breathing, walking, thinking, and feeling

Brain - The control center of the body

Spinal Cord - The major highway to and from the brain

Nerves - Carry the messages to and from the body, so the brain can interpret them and take action

Activity (45 mins): Stations about the Nervous System

On the note sheet are spots for students to record at least one fun thing they learned from each station. *Teacher quickly describes each station and asks for any questions, but at each station there is clear instructions written out or a procedure to follow allowing the students to be more independent and practice following instructions. The teacher floats around the classroom answering any questions that may arise throughout the stations. Each station can be a rough 7 minutes and then rotate clockwise. There should be no more than 5 students per station at any time (just add a station for a bigger class). During each station the students will be asked to record a fun fact or something specific onto their Station Worksheet. *Hand out the worksheet* This worksheet must be full by the end of class.*

Station 1: Brain Dominance - Student discovers what side of their brain is more dominant

Station 2: Color Word Test - Explore the challenges of signals your brain has to go through to say the right word

Station 3: Testing Reflexes with Ruler Catch - Determine how fast your reaction time is (7th graders have to solve for reaction time)

Station 4: Brain Puzzle - Students learn about the different parts of the brain and their functions

Station 5: The Nervous System - Students label the different components of the nervous system and read about the nervous system to learn more

** See attached Station Prep Sheet with what to print, do the day of, and links used for each station. Also attached are the instructions for each station with an objective too!*

Debrief/Recap (5 mins):

Ask what station was their favorite and why?

Show of hands who was right brain dominance? Left brain dominance?

What was one fun thing students learned?

How much does your brain weigh?

Lesson Plan for Next day: Respiratory System
Future Lessons: Digestive System

Sources:

Additional Online Brain Game: <https://braintest.sommer-sommer.com/en/>

Color Words: <https://thecraftyclassroom.com/wp-content/uploads/2015/01/Stroop.pdf>

Dominance Brain Test I:

https://www.cabarrus.k12.nc.us/cms/lib/NC01910456/Centricity/Domain/2716/Brain_Dominance_Inventory-1-1.pdf

Dominance Brain Test II:

http://ca-fcs.org/images/workshop/2015-16/Child_Development/Jana_Din/Right_Left_brain_dominance_test.pdf

Reflex Experiment: <https://faculty.washington.edu/chudler/chreflex.html>

Coloring Sheet: <https://thecraftyclassroom.com/wp-content/uploads/2015/01/NervousSystemPack.pdf>

Book: Body Atlas by Steve Parker pages 6,8,14 (book in P.A.Y. library)

Brain Puzzle: <https://thecraftyclassroom.com/wp-content/uploads/2015/01/BrainGame.pdf>

Color Words Explanation and Mini Cards : <https://faculty.washington.edu/chudler/words.html>

Work Cited (Citations):

Sources in Alphabetical Order:

Chudler, E. H. (2015). Neuroscience For Kids. Retrieved April, 2019, from

<https://faculty.washington.edu/chudler/words.html>

Chudler, E. H. (2015). Reflexes. Retrieved April, 2019, from <https://faculty.washington.edu/chudler/chreflex.html>

File Folder Fun. (n.d.). The Brain Game! Retrieved April, 2019, from

<https://thecraftyclassroom.com/wp-content/uploads/2015/01/BrainGame.pdf>

Right/Left Brain Dominance Test. (n.d.). Retrieved April, 2019, from

http://ca-fcs.org/images/workshop/2015-16/Child_Development/Jana_Din/Right_Left_brain_dominance_test.pdf

Sommer Sommer. (n.d.). Does the brain test measure knowledge or brain development? Retrieved April, 2019, from <https://braintest.sommer-sommer.com/en/>

The Center for Academic Success, Louisiana State University. (n.d.). Brain Dominance Self Test. Retrieved April, 2019, from

https://www.cabarrus.k12.nc.us/cms/lib/NC01910456/Centricity/Domain/2716/Brain_Dominance_Inventory-1-1.pdf

The Crafty Classroom. (n.d.). Say the Color of each word! Retrieved April, 2019, from

<https://thecraftyclassroom.com/wp-content/uploads/2015/01/Stroop.pdf>

The Crafty Classroom. (n.d.). The Nervous System. Retrieved April, 2019, from

<https://thecraftyclassroom.com/wp-content/uploads/2015/01/NervousSystemPack.pdf>

Photos in Order of Appearance:

OpenStax. (2016). Overview of Nervous System. [Online Image] Retrieved from

https://commons.wikimedia.org/wiki/File:1201_Overview_of_Nervous_System.jpg

Feedback: The energizer worked really well and the students seemed to enjoy it. Due to the low attendance, we had 4 groups of 3 students and one group of 2 students. Each station was about 10 minutes long and all students were able to get to every station in within an hour and a half. Stations 1-4 had one teacher present which was helpful for the 5th graders who struggled at points. If doing this activity with one teacher in the future make sure to mix up the teams so a 7th grader is in each group to assist the team in completing the task. Specific feedback for each station:

Station 1: Brain Dominance

There was way too much reading and some of the questions were hard for the students to understand (ie. one that used algebra vs trigonometry). To help this, remove or create your own questions to replace these. Also remove the statistic that most people are left dominant so then the students don't automatically hypothesis they are left brain.

Station 2: Color Word Test

When asked what station was the students' favorite many students pointed to this one. It was a little bit shorter than the others so it was good for them to try to create their own word cards. Also, a timer is essential for this station if no teacher is there with their watch.

Station 3: Test your Reflex

Only have students record two trials of each test. Add a visual or change the heading of each test (ie students didn't know what tactile was so call it "Touch Test" instead). The teacher also was at this station the whole time and was the one to drop the ruler for each student to speed the process up. The reflex vs reaction paragraph can also be shortened with simple definitions and comparisons.

Station 4: The Brain Puzzle

This was a great station and a good length as well. Most students were able to complete this task on their own without a teacher's assistance. The brain maps were printed in color so students didn't have the chance to color them. They were also flipped over so students couldn't use it as a reference when they completed the puzzle.

Station 5: The Nervous System Worksheet

This was supposed to act as the students' note sheet instead of taking notes as a class together before starting the station but it was not clear enough. Students were confused on how/what to color and where to label. Instructions should be rewritten and more direct or a new worksheet should be created to allow the key information to be written down for each student. Color should also ALWAYS be the last step because the students become fixated on it and don't complete the other steps. The book was a good level for the 7th graders to obtain information, but the 5th graders need a more direct reading handout to gather the information. All of the students were very panicked/confused if they didn't get to answer the last three questions which were spelt out for ONLY if time allows. Be aware of this student mindset.

The Nervous System Station Prep

Print: 30 Copies Black and White Nervous System Station Worksheets

Station 1: Brain Dominance

Print:

- 2 Instruction Sheet: black and white
- 15 black and white: Brain Dominance Tests (2 pages each)
- 2 black and white: Brain Dominance Tests Results (2 pages each)

Day of:

- N/A

Station 2: Color Words

Print:

- 3 Color Words: color print (2 pages each)
- 2 Instruction Sheet

Day of:

- Use watch as a timer or have the students—egg timer would be best or from a game that you just flip over
- Cut up the mini cards
- Sheets of white paper and coloring supplies to make their own cards/test

Station 3: Reflexes

Print:

- 2 black and white copies Station 3-Reflexes (2 pages each)
- 10 black and white Reflex Experiment Charts (3 per)

Day of:

- have a teacher at this station to help assist

Station 4: Brain Puzzle

Print:

- Instruction Sheet = 3 color
- Brains to Color and Label = 15 black and white

Day of:

- Label the back of each brain puzzle the part of the brain
- Add a fact or two on each piece
- Cut brain coloring sheets to fit in their science notebooks

Station 5: Nervous System Components

Print:

- 25 Nervous System Parts: black and white (one page each)

Day of:

- place book and coloring utensils at the station
- cut the nervous system part sheets so can fit in their science notebooks

Name: _____

Date: _____

The Nervous System Stations

Station 1: Brain Dominance

Station 2: Color Words

Station 3: Reflexes

Station 4: Brain Puzzle

Station 5: The Nervous System Components

Station 1: Brain Dominance

Objective: Students will discover there are two sides of the brain and learn what side of the brain they use more of and what that might mean.

FUN FACTS ABOUT YOUR "SIDES"

Did you know that there are two sides of your brain? Each side controls different parts and functions like how you do certain things with your right hand vs your left hand. Each side is called a hemisphere. Brain dominance is a theory that infers that we have a preference for using one hemisphere of the brain over the other hemisphere.

- The right side of your body is controlled by the left side of your brain.
- The left side of your body is controlled by the right side of your brain.
- Most people are left-brain dominate, even people who are left-handed writers.
- The left side of your brain controls speech, reading, writing, and math.
- The right side deals with creativity, spatial relationships, abstractions, and your feelings.

Instructions:

1. Read the above fun facts about the two sides of the brain and all the instructions.
2. Write down your hypothesis of what side of the brain you might use more in your Station Worksheet.
3. There are two different self-tests. Pick one and take a worksheet. Follow the instructions and complete the self-test. This is an individual assignment and a quiet assignment. This test is designed to reveal your "dominant side" and examine how you can use this insight to maximize your learning experience.
4. **DO NOT LOOK AT THE RESULTS PAGES UNTIL YOU HAVE COUNTED UP YOUR ANSWERS.**
5. Read about the left and right dominance facts.
6. Record on your Station Worksheet what side of the brain you use more and one thing you learned about it. Do you think this is true about yourself?
7. If there is more time, you can take the other self-test and compare your results. Were the results the same?
8. Flip back over the results pages so they are face down, so the next group doesn't read them before they take their self-tests.

Self-Test I:

Brain Dominance Self Test

In this short self-test you will examine which side of your brain you prefer to use when processing information and learning. Answer each question with your first "gut reaction" and try not to think too hard about each response.

		A	B
1.	How do you prefer to make decisions?	Logically	Intuitively
2.	Which do you remember more easily?	Names	Faces
3.	Which do you prefer?	Planning activities in advance	Doing things spontaneously
4.	When listening to a speaker, which do you pay more attention to?	What the speaker is saying	The speaker's body language
5.	Are you usually aware of what time it is and how much time has passed?	Yes	No
6.	Which way do you typically write papers?	Plan the sequence of ideas in advance	Let your ideas flow freely
7.	Which are you more likely to remember after listening to music?	Words	Tunes
8.	Do you frequently move furniture around in your home?	No	Yes
9.	Are you a good memorizer?	Yes	No
10.	Which subject do you prefer?	Algebra	Trigonometry
11.	How do you plan your day?	List the important activities in order to better see that they are carried out	Just let things happen
12.	Which way do you use a tube of toothpaste?	Carefully roll it up from the bottom	Squeeze it in the middle
13.	When you sit down to study for two hours, how do you work?	I work on one topic for a long period of time until it is completed.	I work on several topics and projects, sometimes going back and forth between them.
14.	Which do you prefer?	The details and specifics of how things work	The big picture, larger concepts and theories
15.	Which questions are you more likely to ask?	"How should I do this?" and "What facts do I need to know?"	"How much of this is really necessary?" and "What is this really all about?"
16.	Which do you prefer?	An established routine	Going with the flow, doing things differently each time
17.	When in a new city, which do you find most helpful?	Clearly worded directions	A map
18.	How do you find yourself preparing for an exam?	With a clear and organized plan of action	With a less organized approach, studying different topic areas a different times
		Total A answers	Total B answers

Self-Test II:

Right/Left Brain Dominance Test

Name _____

Which Side Are You On? Circle either "A" or "B" that most accurately describes you.

1. A. At home, my room has organized drawer and closets. I even try to organize other things around the house.
 B. At home, I like the "lived-in" look. I clean as I see a need and when I have the time.
2. A. My desk is usually clean and has everything in place.
 B. I leave my work out on my desk so I can work as I am inspired by ideas.
3. A. I like using the "tried and true" method.
 B. I like creating new methods.
4. A. I follow directions carefully when I build a model, make a craft, etc.
 B. I like to build a model my way, making my own creation.
5. A. I complete one project at a time.
 B. I like to start many different projects, but do not like to finish them.
6. When I am asked to write a report on a subject, I.....

 A. research information, then outline and organize my writing.
 B. work in my own self-inspired direction.
7. When I had to do a project in class, I.....

 A. used my parents' ideas, a book's illustrated project or modeled another student's project who received an "A+" from my teacher.
 B. loved the challenge, and like a "mad scientist," I produced a unique project.
8. When I am in charge of a big job with many people working, I usually...

 A. organize, give everyone their responsibilities, make lists, and make sure everyone finishes their part on time.
 B. work at my own pace, let others work on the job as they want. I want to take care of needs/problems as they arise.
9. Which of these activities would you like to do the most?

 A. planning the details for a trip/project
 B. creating an original art form
10. I hate it when other people.....

 A. are indecisive about what activities to do when I am with them.
 B. plan activities in step-by-step detail when I am with them.

Self-Test I: Results

Results

Brain dominance is a theory that infers that we have a preference for using one hemisphere of the brain over the other hemisphere. The left hemisphere of the brain is more rational, analytical, and verbal, while the right hemisphere is more holistic and intuitive, responsive to visual imagery. This test is designed to reveal your "dominant side" and examine how you can use this insight to maximize your learning experience.

Left Brain Dominance (Higher score on column A)

Left-brain characteristics include: verbal, logical, linear, concrete, time oriented, and details. You may want to try outlines, lecture notes, or the Cornell Format as study tools.

Right Brain Dominance (Higher score on column B)

Right-brain characteristics include: visual, intuitive, holistic, abstract, spacial and main ideas. You may want to try charts, maps, time lines, graphs, or visualization as study tools.

Brain Dominance Information

Note: You will benefit from using strategies and study tools from BOTH sets listed below. Test out those that you most enjoy, but also challenge yourself to try strategies that may not be in your brain dominance.

People who are Left Brain Dominant

Are often good at...

Looking at details
Focusing on one thing
Giving direct answers
Organization
Individual competition
Establishing routines
Working through ideas
Following schedules

They almost always...

Do things the same way
Like a neat environment
Are self-motivated
Value facts over feelings
Ask "how do I do it?"

They may be frustrated by...

Not knowing the purpose
Not understanding how a teacher grades
Dealing with generalities
Having an opinion expressed as fact
Having to find personal meaning in what you learn
Working in groups
Questions with no right answer

Questions they may ask...

What facts do I need to know?
What should it look like?
When is it due?

They are often more...

Verbal, logical, linear, concrete, time and detail oriented.
They may prefer to organize material and study with...
Outlines, The Cornell Format for notes and linear forms of detailed notes.

People who are Right Brain Dominant

Are often good at...

Seeing the big picture
Cooperating in groups
Giving and receiving praise
Reading Body language
Going with the flow
Doing several things at once
Focusing on ideas/themes
Reading between the lines

They almost always...

Visualize the future
Think fast on their feet
Have good rapport with others
See many solutions
Accept many kinds of people
Try to avoid conflict

They may be frustrated by...

Having to explain things step by step
Accepting criticism without taking it personally
Not knowing the meaning of or purpose in doing something
Keeping detailed records
Having to choose one answer
Re-doing anything once it is done

Questions they may ask...

What does this have to do with me?
How can I make a difference?
How much of this is really necessary?

They are often more...

Visual, intuitive, holistic, abstract, special and oriented toward main ideas.
They may prefer to organize material and study with...
Charts, maps, time lines, graphs using colors and different formatting.

Balanced Brain (no clear dominance)

A balanced score means you are able to draw on the strengths of both the right and left hemispheres of your brain, depending upon a given situation. This combination makes you a creative and flexible thinker.

The down side to having a more "balanced brain" is that you may sometimes feel paralyzed by indecision when the two hemispheres of your brain are competing to solve a problem in their own unique ways. You may also find career choices difficult due to your proficiency in several different areas. As mentioned above, you will benefit from using both right and left brain tools.

Self-Test II: Results

Scoring the Left/Right Brain Test

Add the number of "A" responses.
Write the sum here. _____

Add the number of "B" responses.
Write the sum here. _____

If A > B then you are left brain is dominate.

This means you.....

- are very rational
- analyze people and situations
- usually favor the subjects of math/science
- are methodical
- are a sequential thinker
- use logical reasoning
- like to work with things that can be seen or touched

If B > A then you are right brain is dominate.

This means you.....

- are very creative
- are usually emotional
- like to be different from others
- handle situations easily
- like to think abstractly
- enjoy the arts(music,art,drama)
- are a divergent thinker

The Differences Between Right & Left Brain Thinking

Right brain or creative thinkers gather information by feelings and intuition. This information is retained by using images and patterns and are able to visualize the whole idea as we gather our research. The thought processes appear illogical and meandering because they are emotional, intuitive, abstract and laterally connected. Analysis of this information or problem-solving often involves free association and, while the solutions may be quite innovative, the route traveled to reach this conclusion would be impossible for a more rational left brain thinker to follow. Visual thinkers do not use a step-by-step process to gather information -- rather it is visually gathered all at once which makes organization of this information and verbalizing the accumulated data, either in written or verbal form, difficult. Right brain thinkers are best able to express themselves using art, music or dance.

Left Brain or Critical Thinkers collect information using logic and sense. This information is retained using words, numbers and symbols. Unlike right brain thinkers who see the whole concept, left brain thinkers see only parts of the whole idea that guides them in their logical, step-by-step gathering of information. Their brain processes are deductive, rational, concrete and analytically connected. Left brain thinkers express themselves with concise words, numerical and written formulas and technological systems.

Modern scientists know that your left brain is your verbal and rational brain while your right brain is you nonverbal and intuitive brain. We require special functions from both sides of our brains to accomplish most tasks in our daily lives. There are some nonverbal tasks -- such as drawing, painting, dancing and music, in which our right brain excels and you'd be best to shelve your left brain functions to prevent interference by your rational side.

While most people can be categorized as left or right brain thinkers, there are exercises that can help you develop and nurture your intuitive side.

Station 2: Color Words

Objective: Students will test their brain and see how fast they can read the color of the color words spelt out.

Instructions:

1. Decide with your partner who is the timer first and who is the player first
2. Round 1: Timer person flips over the Color Word Sheet, and the player needs to read aloud the words. The timer times how long it takes them to do so.
3. Round 2: Timer person flips the sheet back over and the player now has to read aloud the color of the words, not what the words spell.
4. Player records both times on their Station Worksheet.
5. Player and timer switch spots so each person has a chance to do both rounds, repeat steps 2-4 with the new roles.
6. Read the "What is this called?" paragraph below to learn more about why it is difficult to read the color vs the word. Write a fun fact on your Station Worksheet.
7. If time allows:
 - a. Repeat the game trying to beat your times
 - b. Use the mini cards to see how many colors you can say correctly in a minute
 - c. Create your own cards or test with different words besides colors. Example: Truck (write it in blue) Hello (write in hello) etc.

What is this called?

The famous "Stroop Effect" is named after J. Ridley Stroop who discovered this strange phenomenon in the 1930s.

The words themselves have a strong influence over your ability to say the color. The interference between the different information (what the words say and the color of the words) your brain receives causes a problem. There are two theories that may explain the Stroop effect:

1. Speed of Processing Theory: the interference occurs because words are read faster than colors are named.
2. Selective Attention Theory: the interference occurs because naming colors requires more attention than reading words.

Say the Color of each Word!

(Don't read the word)

How Fast can you say it?

black white yellow green red blue
yellow red black green white red
white green red black yellow green
black white yellow green red blue
white green red black yellow green
yellow red black green white red
white green red black yellow green

STROOP TEST MINI CARDS

RED	BLUE	GREEN	BLUE	BLACK
YELLOW	GREEN	ORANGE	GREEN	RED
PINK	BLACK	BROWN	YELLOW	GRAY
BLUE	RED	GREEN	PINK	BROWN
ORANGE	BLACK	BLUE	GREEN	RED

RED	BLUE	GREEN	BLUE	BLACK
YELLOW	GREEN	ORANGE	GREEN	RED
PINK	BLACK	BROWN	YELLOW	GRAY
BLUE	RED	GREEN	PINK	BROWN
ORANGE	BLACK	BLUE	GREEN	RED

RED	BLUE	GREEN	BLUE	BLACK
YELLOW	GREEN	ORANGE	GREEN	RED
PINK	BLACK	BROWN	YELLOW	GRAY
BLUE	RED	GREEN	PINK	BROWN
ORANGE	BLACK	BLUE	GREEN	RED

RED	BLUE	GREEN	BLUE	BLACK
YELLOW	GREEN	ORANGE	GREEN	RED
PINK	BLACK	BROWN	YELLOW	GRAY
BLUE	RED	GREEN	PINK	BROWN
ORANGE	BLACK	BLUE	GREEN	RED

STROOP TEST MINI CARDS

RED	BLUE	GREEN	BLUE	BLACK
YELLOW	GREEN	ORANGE	GREEN	RED
PINK	BLACK	BROWN	YELLOW	GRAY
BLUE	RED	GREEN	PINK	BROWN
ORANGE	BLACK	BLUE	GREEN	RED

RED	BLUE	GREEN	BLUE	BLACK
YELLOW	GREEN	ORANGE	GREEN	RED
PINK	BLACK	BROWN	YELLOW	GRAY
BLUE	RED	GREEN	PINK	BROWN
ORANGE	BLACK	BLUE	GREEN	RED

RED	BLUE	GREEN	BLUE	BLACK
YELLOW	GREEN	ORANGE	GREEN	RED
PINK	BLACK	BROWN	YELLOW	GRAY
BLUE	RED	GREEN	PINK	BROWN
ORANGE	BLACK	BLUE	GREEN	RED

RED	BLUE	GREEN	BLUE	BLACK
YELLOW	GREEN	ORANGE	GREEN	RED
PINK	BLACK	BROWN	YELLOW	GRAY
BLUE	RED	GREEN	PINK	BROWN
ORANGE	BLACK	BLUE	GREEN	RED

Station 3: Reflexes

Objective: Students will test their reflexes and calculate their reaction times.

Reaction vs. Reflex

In this experiment you are going to be introduced to what a reflex and reaction are and how we go about measuring them.

The speed of your reactions play a large part in your everyday life. Fast reaction times can produce big rewards, for example, like saving a blistering soccer ball from entering the goal. Slow reaction times may come with consequences. Reaction time is a measure of the quickness an organism responds to some sort of stimulus.

You also have "reflexes" too. Reflexes and reactions, while seeming similar, are quite different. Reflexes are involuntary, used to protect the body, and are faster than a reaction. Reflexes are usually a negative feedback loop and act to help return the body to its normal functioning stability, or homeostasis.

Instructions:

1. Read the above paragraph about reflexes.
2. Write the definition of a reflex on your Station Worksheet.
3. Each person takes one chart which is where you fill in your centimeters during each test. *This will later be glued into your science notebook.*
4. Work with a partner to follow the experiment procedure. One person is Subject 1 and the second person is Subject 2.
5. Follow the **Converting your centimeters to Reaction TIME** instructions when your chart is filled in.

<i>SUBJECT</i>	<i>VISUAL</i>		<i>AUDITORY</i>		<i>TACTILE</i>	
#1						
#2						
<i>AVERAGE</i>						

Name: _____ Date: _____

<i>SUBJECT</i>	<i>VISUAL</i>		<i>AUDITORY</i>		<i>TACTILE</i>	
#1						
#2						
<i>AVERAGE</i>						

Name: _____ Date: _____

<i>SUBJECT</i>	<i>VISUAL</i>		<i>AUDITORY</i>		<i>TACTILE</i>	
#1						
#2						
<i>AVERAGE</i>						

Name: _____ Date: _____

<i>SUBJECT</i>	<i>VISUAL</i>		<i>AUDITORY</i>		<i>TACTILE</i>	
#1						
#2						
<i>AVERAGE</i>						

Procedure:

Visual Test

1. Subject one dangles dominant hand off the edge of a table.
2. Subject two holds a 30 centimeter (12-inch) ruler between two fingers at the 30 cm mark, having the 0 mark touching subject one's index finger.
3. Subject two tells subject one to grab the ruler as fast as possible, when they SEE it being released.
4. Record the centimeter measurement.
5. Repeat this three times, for a total of four measurements

Auditory Test

1. Subject one is blindfolded before dangling dominant hand off the edge of a table.
2. Subject two holds a 30 centimeter (12-inch) ruler between two fingers at the 30 cm mark, having the 0 mark touching subject one's index finger.
3. Subject two tells subject one to grab the ruler as fast as possible, when they HEAR the word "release" being said.
4. Subject two simultaneously says "release" and lets go of the ruler. Record the centimeter measurement.
5. Repeat this three times, for a total of four measurements

Tactile Test

1. Subject one is blindfolded before dangling dominant hand off the edge of a table.
2. Subject two holds a 30 centimeter (12-inch) ruler between two fingers at the 30 cm mark, having the 0 mark touching subject one's index finger.
3. Subject two tells subject one to grab the ruler as fast as possible, when they FEEL their non-dominant shoulder being touched.
4. Subject two simultaneously touches the shoulder and lets go of the ruler. Record the centimeter measurement.
5. Repeat this three times, for a total of four measurements

Converting your centimeters to Reaction TIME:

1. Use the chart to find your reaction TIME.

CM Distance	Seconds
3.0	0.08
4.0	0.09
5.0	0.10
6.0	0.11
7.0	0.12
8.0	0.13
9.0	0.13
10.0	0.14
11.0	0.15
12.0	0.16

CM Distance	Seconds
13.0	0.16
14.0	0.17
15.0	0.17
20.0	0.20
25.5	0.23
25.5	0.23
30.5	0.25
43.0	0.30
61.0	0.35
79.0	0.40

2. Record the reaction times in your Station Worksheet. Discuss which test had the best reflex time.
3. If time allows (and especially for 7th graders), use the following equation to determine what your reaction time is. *Show ALL your work on the back side of your Station Worksheet.*

$$t = \sqrt{\frac{2y}{g_0}}$$

t= time in seconds (what you are solving for)

y= the distance you measured in centimeters

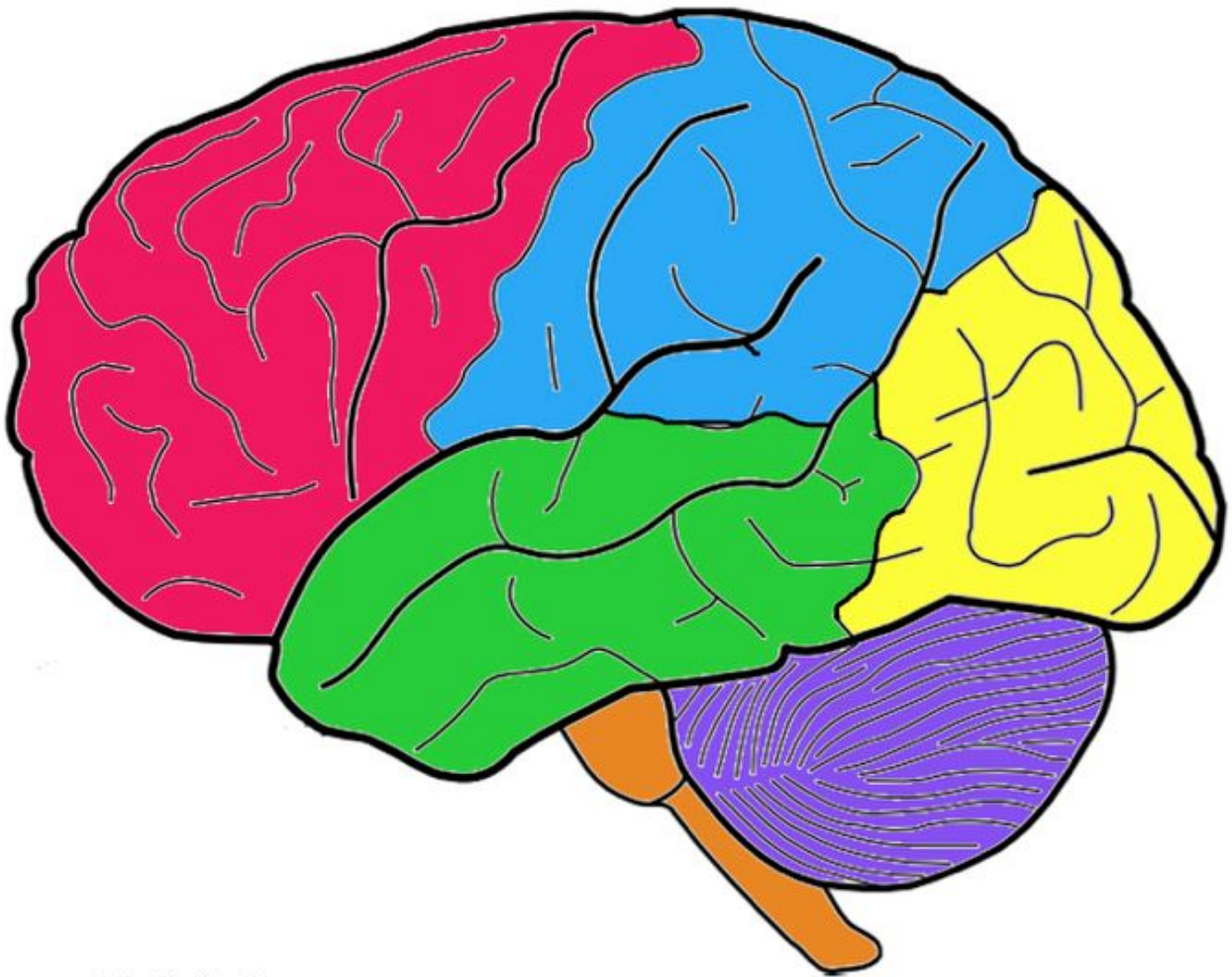
g₀= the acceleration due to gravity constant (980 cm/sec²)

Station 4: Brain Puzzles

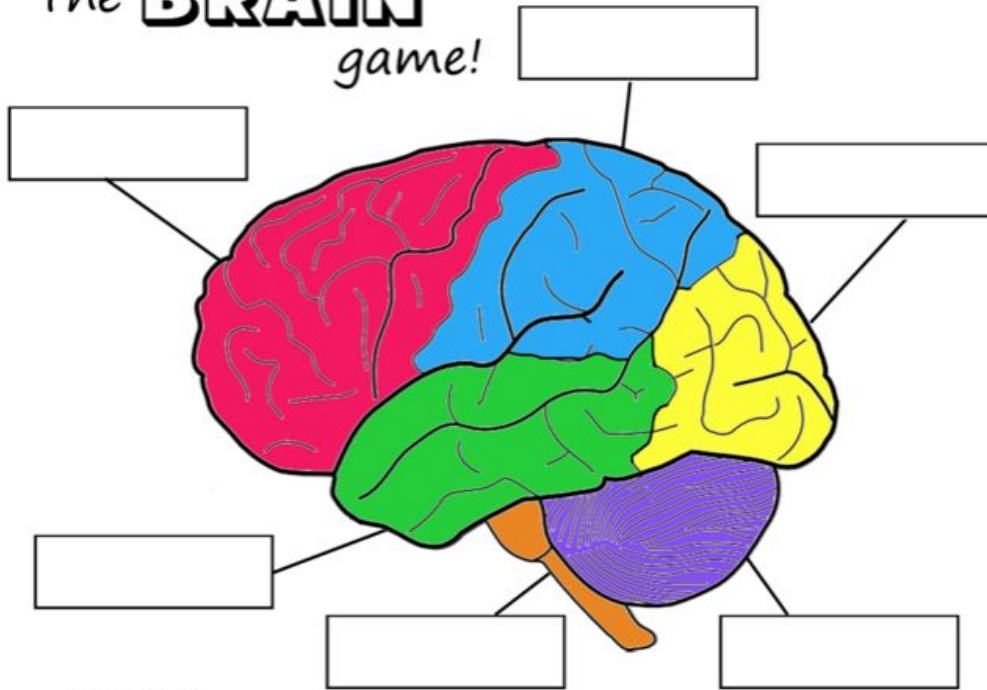
Objective: Students will work in partners to complete the brain puzzle. Each student will label their own brain diagram and will color each section of the brain.

Instructions:

1. Work in pairs to complete the brain puzzle.
2. After the brain is complete read the facts and parts of the brain.
3. Write down at least 1 fact on your station worksheet.
4. Each student labels their own brain sheet and colors in each part of the brain in a different color.



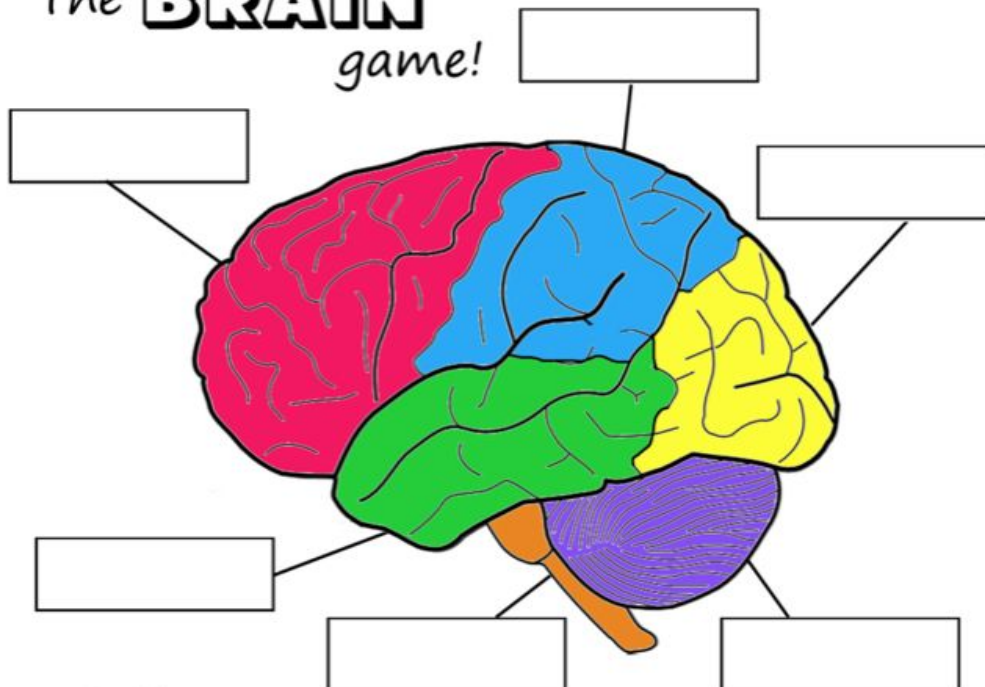
The **BRAIN** game!



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The **BRAIN** game!



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Station 5: The Nervous System Components

Objective: Students will be able to label and identify the three main components of the Nervous System.

Instructions:

1. Everyone takes one sheet titled The Nervous System and write your name and date at the top.
 2. Take turns reading the Body Atlas (pages 6,8,14) to help label the parts of the nervous system.
 3. Color in the different parts.
 4. In your Station Worksheet write down; The nervous system is made up of _____, _____, and _____. One fact about the nervous system is _____.
 5. If more time, continue to read more about the nervous system and other body systems. And record in your Station Worksheet:
 - a. The brain weighs _____ kg
 - b. There are _____ number of pairs of nerves that connect to the brain.
 - c. The _____ nerve is connected to the eye and is used for _____.
 6. The Nervous System Sheet will be glued into your science notebook.
-

Station 5: The Nervous System Components

Objective: Students will be able to label and identify the three main components of the Nervous System.

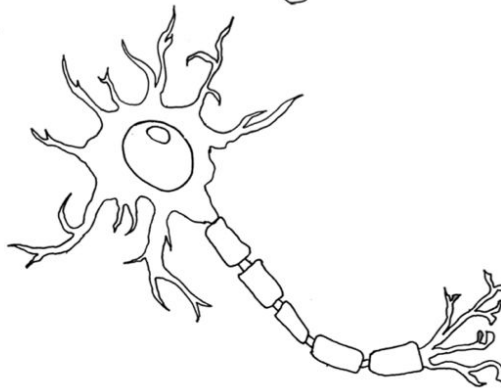
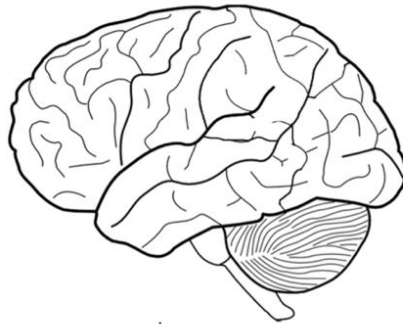
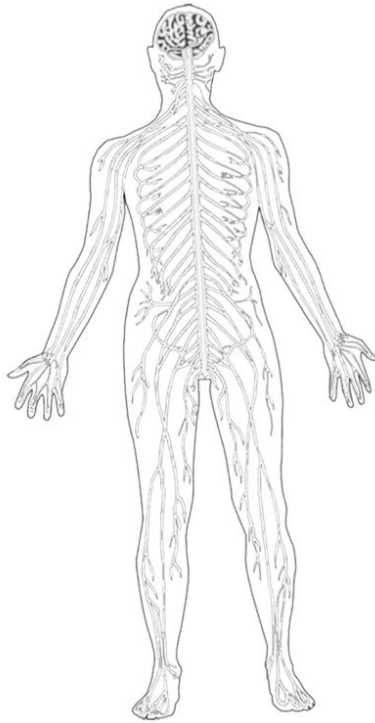
Instructions:

1. Everyone takes one sheet titled The Nervous System and write your name and date at the top.
2. Take turns reading the Body Atlas (pages 6,8,14) to help label the parts of the nervous system.
3. Color in the different parts.
4. In your Station Worksheet write down; The nervous system is made up of _____, _____, and _____. One fact about the nervous system is _____.
5. If more time, continue to read more about the nervous system and other body systems. And record in your Station Worksheet:
 - a. The brain weighs _____ kg
 - b. There are _____ number of pairs of nerves that connect to the brain.
 - c. The _____ nerve is connected to the eye and is used for _____.
6. The Nervous System Sheet will be glued into your science notebook.

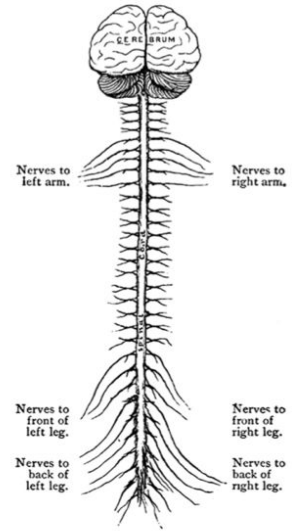
Name: _____

Date: _____

The Nervous System



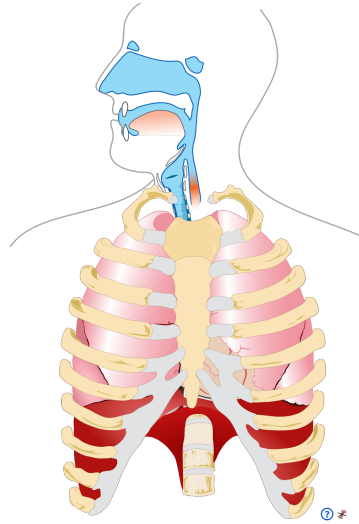
Brain
Spinal Cord
Nerves



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Lesson 22: Respiratory System



Objectives: Learners will understand the basic structure and functions of the breathing system and know various diseases that can affect the breathing system. Students will understand that smoking can harm the lungs.

Standards Covering: *(Taken from Namibian Syllabi)*

Standard 1 Identify and label the structures of the breathing system

Standard 2 Describe the functions of the following parts: nasal cavity, voice box, windpipe, ribs and diaphragm

Standard 3 Describe the path of air through the parts of the breathing system (demonstrate how the lungs get inflated with air using lungs of a goat or a sheep)

Standard 4 Explain inhaling and exhaling with reference to the ribs and diaphragm

Standard 5 Suggest how sustained exposure to polluted air and smoke can damage the lungs

Materials: Plastic bottles, straws, balloons, tape scissors.

Prep-Work: Take out all of the materials

Energizer (3 mins): Have the students close their eyes and practice quiet breathing. Everyone closes their eyes for 60 seconds. No talking. Take deep breaths in and out for 60 seconds and think about how you are breathing. What system has your body created to allow you to breathe? What organs are in use? How do they work?

Key Vocabulary:

Nasal Cavity - The area around the nose and eyes that cleans the air people breathe in.

Larynx - (also called voice box) is in the neck and contains the vocal cords.

Trachea - (also called windpipe) connects the voice box to the lungs and lets air get to the lungs.

Lungs - The main part of the respiratory system and puts oxygen into the bloodstream.

Diaphragm - A muscle that moves up and down to expand the lungs. This helps a person breathe.

Activity (90 mins):

1. Know/Learned Chart

Read the learning objectives to the class. Draw two columns on the chalkboard with the first column labeled “know” and the second column labeled “learned”. Ask your students what they know about the respiratory system. Write the information in the first column.

2. Note Sheet (Define Words on the Board)

So this is what we already know about the body’s breathing system. Let’s try to learn more today. Who can tell me what number 1 on the diagram is? Number 1 is the nasal cavity. Who thinks they can stand up and tell us about the nasal cavity?

- **Define: Nasal cavity** cleans the air people breathe in.

So once we breathe air in, it goes through our nasal cavity. We all have hairs in our nose that clean the air we breathe in. Then the air passes the voice box. Who can tell me what number the voice box is? When we breathe air into our lungs, the air vibrates the vocal cords and that’s how we talk.

- **Define: Larynx** (also called voice box) contains the vocal cords.

What is the next place that air travels when we breathe in? Number 3 on the diagram is the trachea.

- **Define: Trachea** (also called windpipe) connects the voice box to the lungs and lets air get to the lungs.

So the air travels through the trachea to the lungs. What are the lungs? Who can stand up and give me a definition?

- **Define: Lungs** puts oxygen into the body and removes carbon dioxide.

And what’s the last number on the diagram.

- **Define: Diaphragm** is a muscle that moves up and down to expand the lungs. This helps a person breathe.

3. Making a Breathing System Model

Inhale and Exhale Explanation: Explain with the Model -

As you breathe in, your diaphragm contracts and flattens out. This allows it to move down, so your lungs have more room to grow larger as they fill up with air. "Move

over, diaphragm, I'm filling up!" is what your lungs would say. And the diaphragm isn't the only part that gives your lungs the room they need. Your rib muscles also lift the ribs up and outward to give the lungs more space.

At the same time, you inhale air through your mouth and nose, and the air heads down your trachea, or windpipe. On the way down the windpipe, tiny hairs called **cilia** (say: SILL-ee-uh) move gently to keep mucus and dirt out of the lungs. The air then goes through the series of branches in your lungs, through the bronchi and the bronchioles.

When it's time to exhale (breathe out), everything happens in reverse: Now it's the diaphragm's turn to say, "Move it!" Your diaphragm relaxes and moves up, pushing air out of the lungs. Your rib muscles become relaxed, and your ribs move in again, creating a smaller space in your chest.

4. Lung Health Discussion (if time permits)

Key Points to Hit:

- Exposure to pollution affects lung health. Why? Pollution particles get stuck in the lungs.
- Miners breathe in a lot of soot and pollution because when they mine, they dislodge a lot of particles from the rock into the air. Since they work in a small space, they breathe in a lot of the particles. Therefore, they are exposed to more pollution in the mines.
- Smoking causes the most damage to lungs.

Debrief/Recap (5 mins): Ask the students to go up to the board and write new things they've learned in the "learned column"

Lesson Plan for Next day: Digestive System
Future Lessons: Recap of Human Body Systems

Sources:

Activities and Notesheet (A Few of the Worksheets Were Adapted to Better Suit our Learners):

<https://www.education.com/download/lesson-plan/respiratory-system/respiratory-system.pdf>

<https://www.education.com/lesson-plan/respiratory-system/>

<https://kidshealth.org/en/kids/lungs.html#cataches>

<https://www.livescience.com/22616-respiratory-system.html>

Lungs in a Bottle:

<https://www.fizzicseducation.com.au/150-science-experiments/human-body-science/make-a-lung-model/>

<https://www.thoughtco.com/how-to-make-a-lung-model-373319>

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Dowshen, S. (Ed.). (2018, June). Your Lungs & Respiratory System (for Kids). Retrieved from

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Sohail, S. (2018, September 12). Breathe In, Breathe Out: The Respiratory System | Lesson Plan | Education.com

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Zimmermann, K. A. (2018, February 12). Respiratory System: Facts, Function and Diseases. Retrieved from

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Photos in Order of Appearance:

B, M. (2014, March 3). Human respiratory system pedagogical [Digital image]. Retrieved from

https://de.wikipedia.org/wiki/Datei:Human_respiratory_system_pedagogical_fr.svg

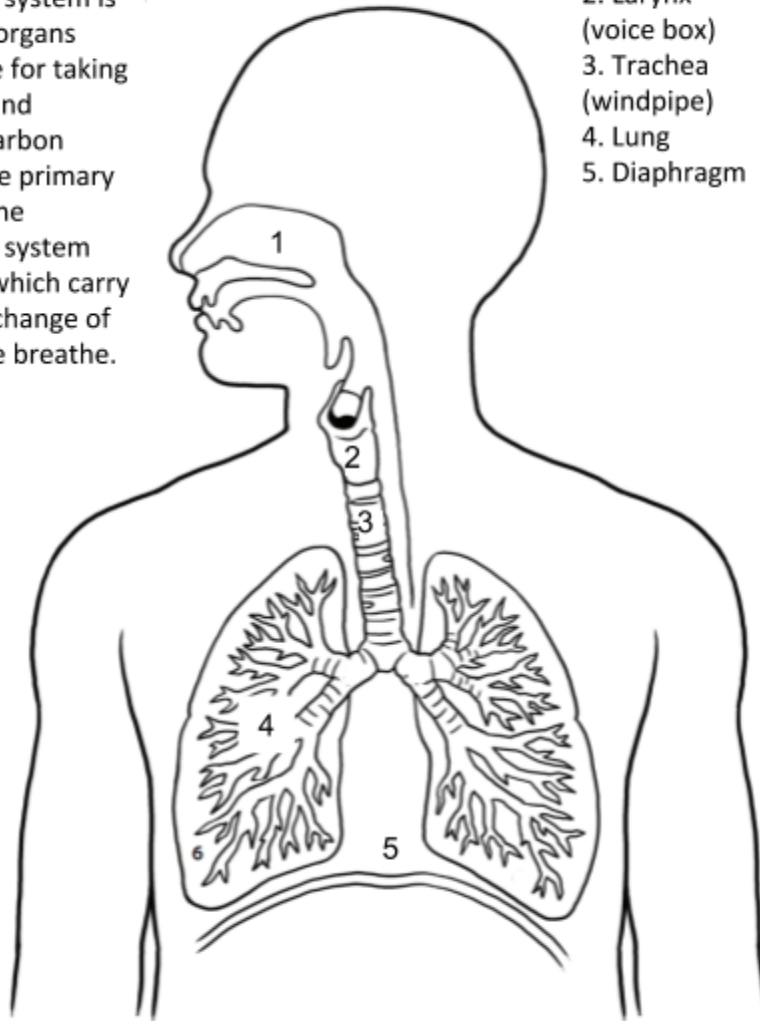
Feedback: The students were bored while taking notes with this worksheet. We suggest that the 7th grade students should help teach the diagram worksheet because they have learned it before and it will be good reinforcement for them.

The students were excited about building the lung models but there were a few issues with the activity. This activity was pretty loud because of the balloons which was a challenge in our classroom because it is located right outside the office. Another issue was that some of the bottles were flimsy and when we went to stretch the balloon around the bottom of the bottle, it would give way and not hold the balloon. If this is done in the future, 1L bottles should be used and they should be thick bottles (such as Oasis bottles).

Respiratory System

The human respiratory system is a series of organs responsible for taking in oxygen and expelling carbon dioxide. The primary organs of the respiratory system are lungs, which carry out this exchange of gases as we breathe.

1. Nasal cavity
2. Larynx (voice box)
3. Trachea (windpipe)
4. Lung
5. Diaphragm



Definitions

1. Nasal cavity: _____
2. Larynx (voice box): _____
3. Trachea (windpipe): _____
4. Lung: _____
5. Diaphragm: _____

Your Respiratory System

Directions: Look at the diagram. Read about what each part of the respiratory system does. Label each part of the respiratory system on the diagram.

nose – contains two nostrils which brings air in and out of the body

answer: _____

trachea or windpipe – a tube that connects the upper respiratory system to the lungs

answer: _____

lungs – the main part of the respiratory system; it puts oxygen into the bloodstream

answer: _____

mouth – can be used to suck in or expel air

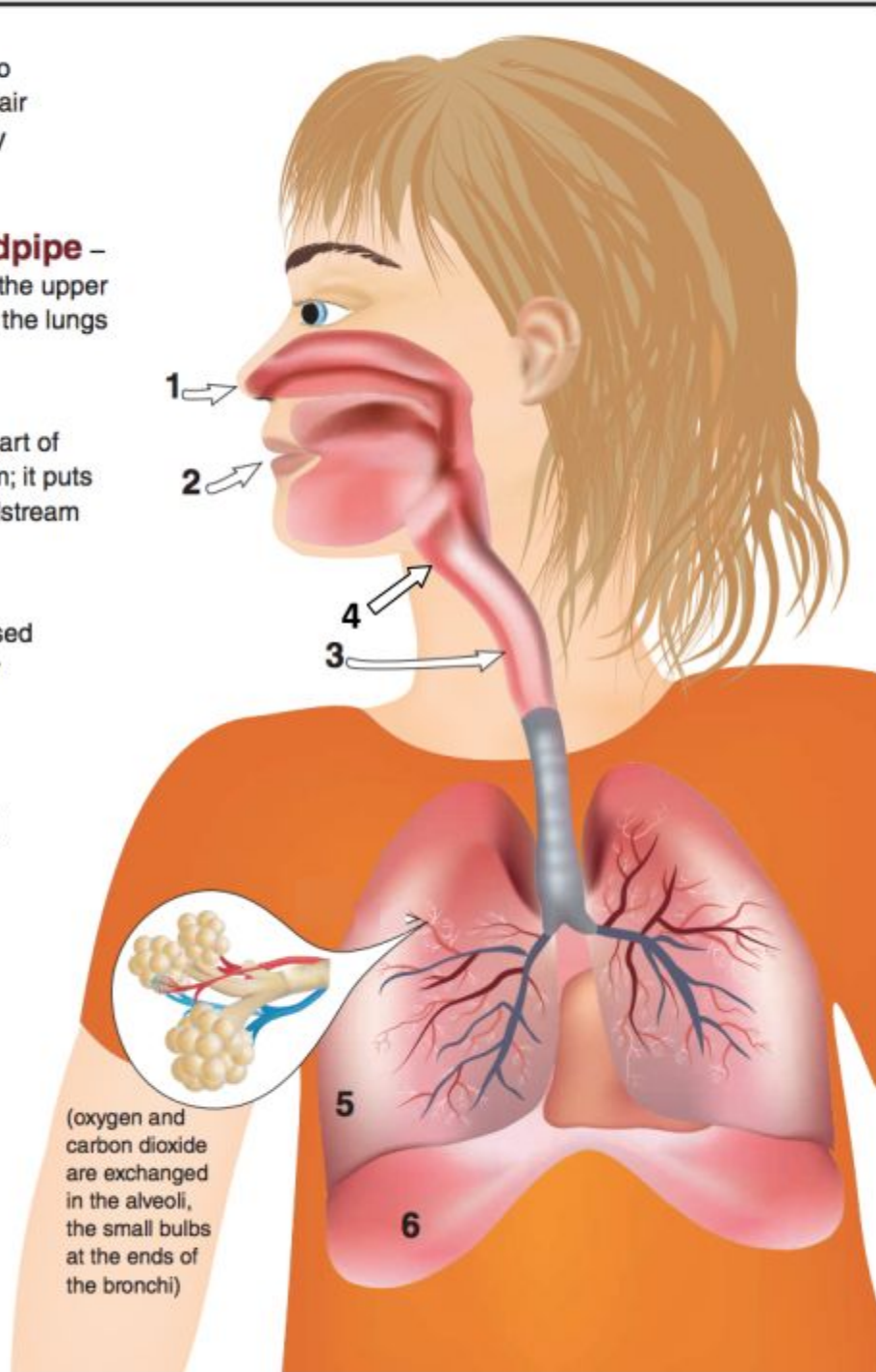
answer: _____

larynx - contains the vocal cords and allows us to speak

answer: _____

diaphragm – muscle that moves up and down to help expand your lungs

answer: _____



(oxygen and carbon dioxide are exchanged in the alveoli, the small bulbs at the ends of the bronchi)

Your Respiratory System MEMORANDUM

Directions: Look at the diagram. Read about what each part of the respiratory system does. Label each part of the respiratory system on the diagram.

nose – contains two nostrils which brings air in and out of the body

answer: 1

trachea or windpipe – a tube that connects the upper respiratory system to the lungs

answer: 3

lungs – the main part of the respiratory system; it puts oxygen into the bloodstream

answer: 5

mouth – can be used to suck in or expel air

answer: 2

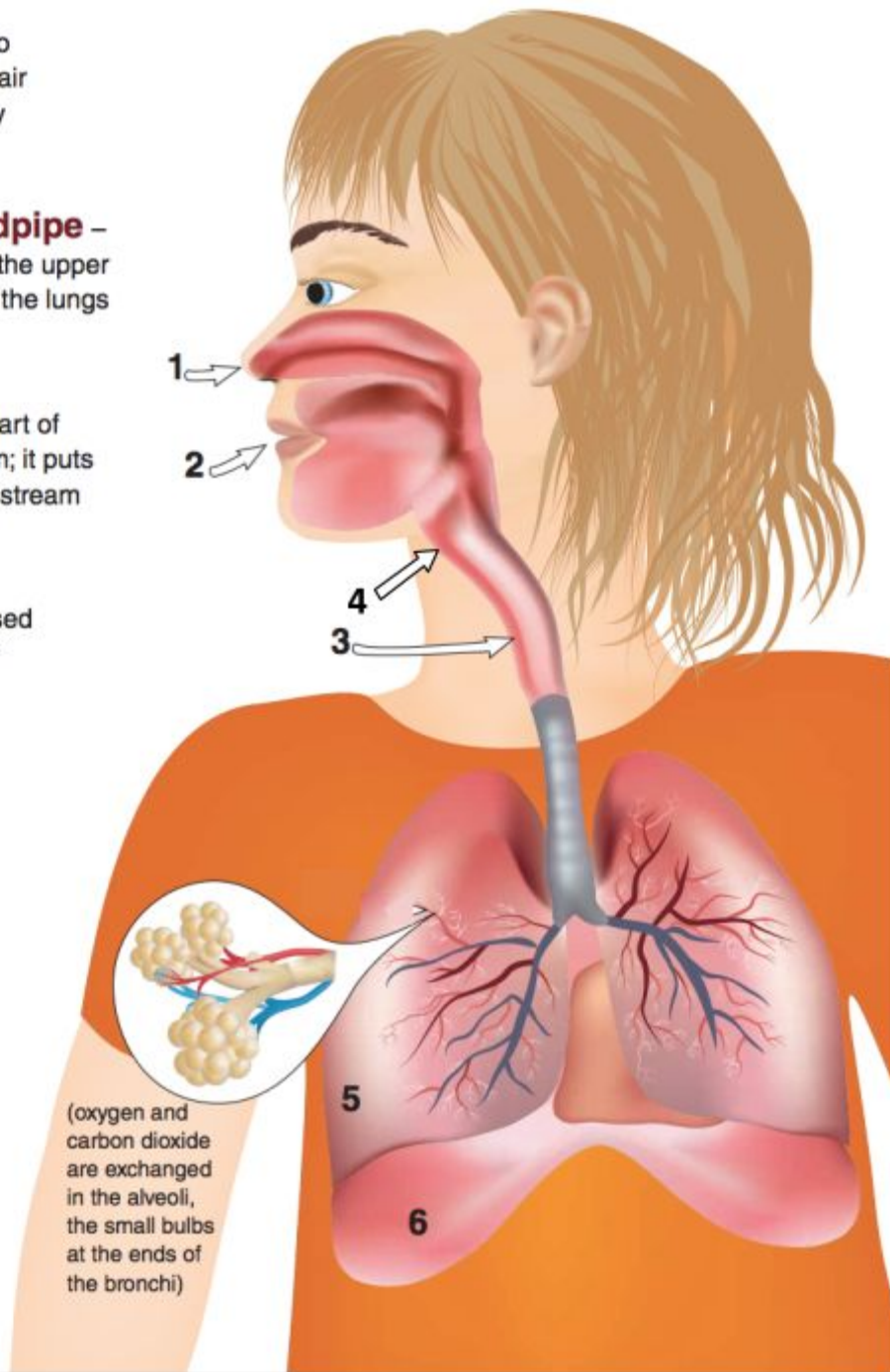
larynx - contains the vocal cords and allows us to speak

answer: 4

diaphragm – muscle that moves up and down to help expand your lungs

answer: 6

(oxygen and carbon dioxide are exchanged in the alveoli, the small bulbs at the ends of the bronchi)



Lungs in a Bottle Model Instructions

Purpose: Have the students visualize and understand how the diaphragm works to help the lungs inhale and exhale. This is in line with the Namibian Syllabus saying that learners should be able to “explain inhaling and exhaling with reference to the ribs and diaphragm”

Materials:

Water bottles for every pair of students
(or 1 per table depending on available materials)
2 straws per group
3 balloons per group
Electrical or duct tape
Rulers

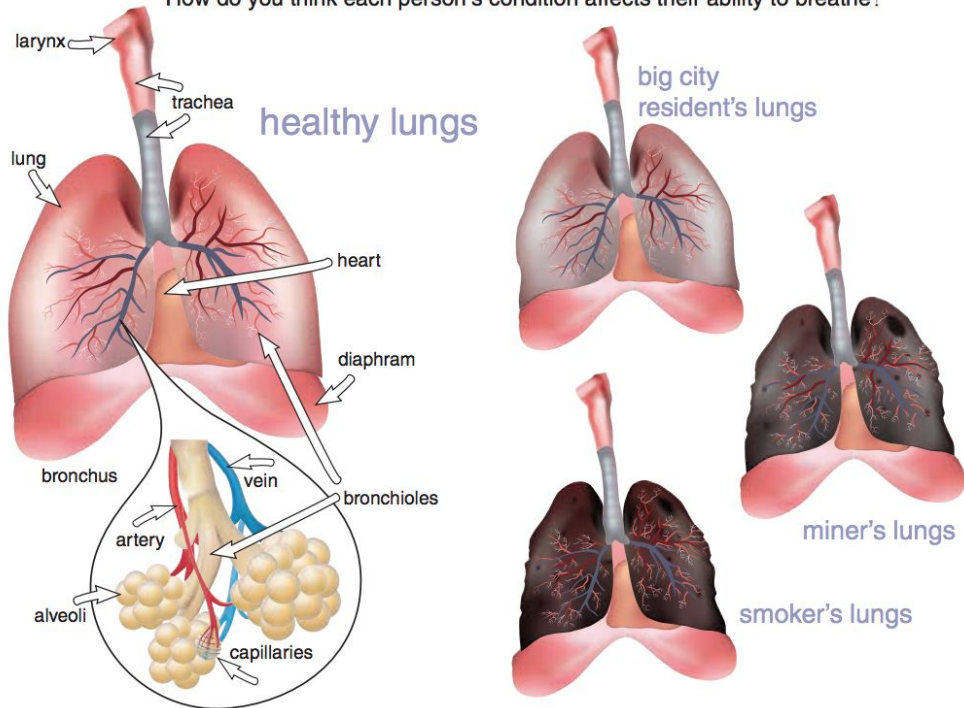
Procedure:

Each group should take turns completing the steps of the procedure. Make sure that everyone in the group has the chance to complete steps in making the model. Demonstrate each step before the students do it.

1. Have the students measure 20 cm down from the top of the bottle and make a mark with a marker.
2. Have the next student in the group cut the bottle at that mark. They should cut all the way around so that the bottom of the bottle is completely cut off.
3. Take two straws and bend them out. Then, tape them together so that the bottoms of the straws are together and the bendy parts of the straws point away from each other. Tape the straws in multiple points so that they are sturdy.
4. Poke a hole large enough for these two straws in the cap. Students will probably need help with this.
5. Take two balloons and cut the neck off of them.
6. Tape the balloons to the straws. Make sure that the balloons are taped on so that they are airtight. These represent the two lungs that each person has.
7. Feed the straws and balloon through the bottom of the bottle and through the cap.
8. Tape the straws into place. Use enough to make sure that the seal is air tight.
9. Cut the neck off of the third balloon. Stretch this balloon over the bottom of the bottle. This represents the diaphragm muscle.
10. Now, blow into the straws and pull the balloon that represents the diaphragm down and push it back up. The lungs will inflate and deflate as you push and pull the diaphragm. This represents inhaling and exhaling.

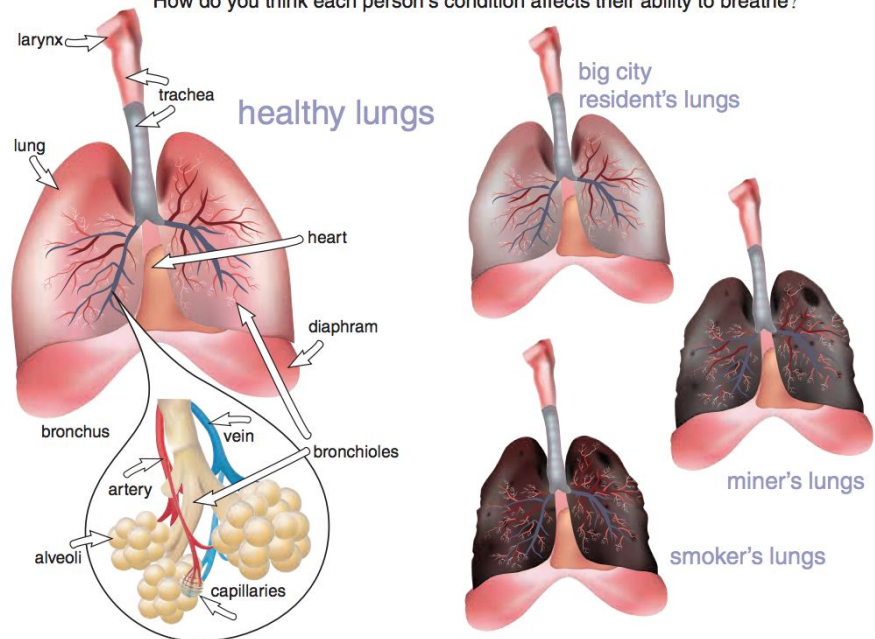
Are your lungs healthy?

Directions: Compare the healthy pair of lungs to the other types of lungs.
How do you think each person's condition affects their ability to breathe?



Are your lungs healthy?

Directions: Compare the healthy pair of lungs to the other types of lungs.
How do you think each person's condition affects their ability to breathe?



Lesson 23: Digestive System



Objectives: Learners will be able to label the various parts of the digestive system and acknowledge the necessity of its functions for healthy living

Standards Covering: (Taken from Namibian Syllabi)

Standard 1 Identify the different parts of the digestive system from a diagram

Standard 2 State the functions of each part identified

Materials: All materials under the Digestive System Demo, worksheet printouts,

Prep-Work: Collect all of the materials and print out worksheets

Energizer (5 mins):

Swallow This!

PROCEDURE

1. Instruct class to stand next to their seats.
2. Recite the passage below and demonstrate stated moves with each step.
3. After introduction of energizer, pause during narrative and provide students time to call out the regions of the gastrointestinal tract and perform appropriate movements without instruction.

Pretend you are a bite of food. All food travels through a very long tube in our body called the **DIGESTIVE SYSTEM**. What stops will you make along the way?

- a) **Mouth** → "You are in the **MOUTH** being chewed. Jump up and down!" (students instructed to land in the same spot each time) (10 seconds)
- b) **Throat** → "Stop! You were swallowed. You slowly enter the **THROAT**. Move in slow-motion!" (students instructed to slowly lift arms from their sides to above their head and back down while slowly squatting lower and lower to the ground) (5 seconds)
- c) **Stomach** → "Stop! You just entered the **STOMACH**. You are getting thrown around as the stomach mixes the food. Jump and spin around!" (students instructed to land in the same spot each time) (10 seconds)
- d) **Intestines** → "Stop! Now you are in the **INTESTINES**. The intestines share food with other parts of the body. Jump like a rabbit over to the wall! (instruct students to jump as far as possible with each jump towards walls of classroom). If the body decides you are not helpful, you continue moving through the intestines. Jump from side-to-side as you move through the tube (instruct students to jump sideways with feet facing forward)" (15 seconds)
- e) **Rectum** → "Your journey is almost over. You are now in the **RECTUM**, where food leaves the body. As a group, take 5 hops towards the door." (10 seconds)

Key Vocabulary:

Mouth - First stop for the food: the mouth chews the food and breaks it up into small pieces.

Esophagus - The tube that connects the mouth to the stomach.

Stomach - Organ that uses acid and muscles to break down food.

Small Intestine - Long tube that takes nutrients out of food for the body to use.

Large Intestine - Fat tube that takes the water out of food and leaves waste: the large intestine creates fecal matter and pushes it into the rectum.

Rectum - Holds fecal matter until you are ready to go to the bathroom.

Activity (45-60 mins):**1. Digestive System Demo**

Link to demo: <https://www.youtube.com/watch?v=7av19YhNkhE>

Follow the Demo Procedure

2. Diagram

Have all of the students fill out the digestive system diagram independently.

3. Board Game

Have each student cut out a circle and fill it in a specific color. Everyone playing with the same game board should have a different color and there should be 2-4 learners per game board (4 is max). A dice is required to complete this game but if no dice are available, print out the numbers 1-3 and cut them up into little slips. Put these slips in a bag and have the learners pick a random one out of the bag when it's their turn to go. This will replace rolling the dice.

Debrief/Recap (5 mins): Have each team make a digestive system recap poster that includes...

- Main Organs of the Digestive System
- Function of the Digestive System

Lesson Plan for Next day: Body Systems Review Lesson

Sources:

Energizer: <http://getfittogetherla.org/wp-content/uploads/2015/10/1-Minute-Energizers.pdf>

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Definitions: <https://kidshealth.org/en/kids/digestive-system.html#cataches>

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Feedback: This lesson was not taught because we didn't have class on Friday this week.

Digestive System Demo

Purpose: Demonstrate how each organ in the digestive system works to break down food and supply the body with nutrients.

Materials:

Lemon juice/orange juice

Water

Crackers

Banana

Tray

Paper cup uncut

Paper cup with the bottom cut out

Paper cup with a hole in the bottom

Plastic bag

Scissors

Tights

Demo Procedure:

First we put the crackers and the banana into a plate or bowl. Break it up a little to represent chewing.

Then, pour it into the bag which is our stomach demonstrating the swallowing process. Then we add the orange juice which is the acid in our stomach and the water which is the saliva. We're going to squash it up, mimicking the action of the stomach walls squashing our food together. It will take a couple of minutes to get a good consistency.

Next we'll transfer the food into the small intestine aka the tights. Cut the bottom off a plastic cup and use it as a funnel to pour the food out of the bag and into the tights.

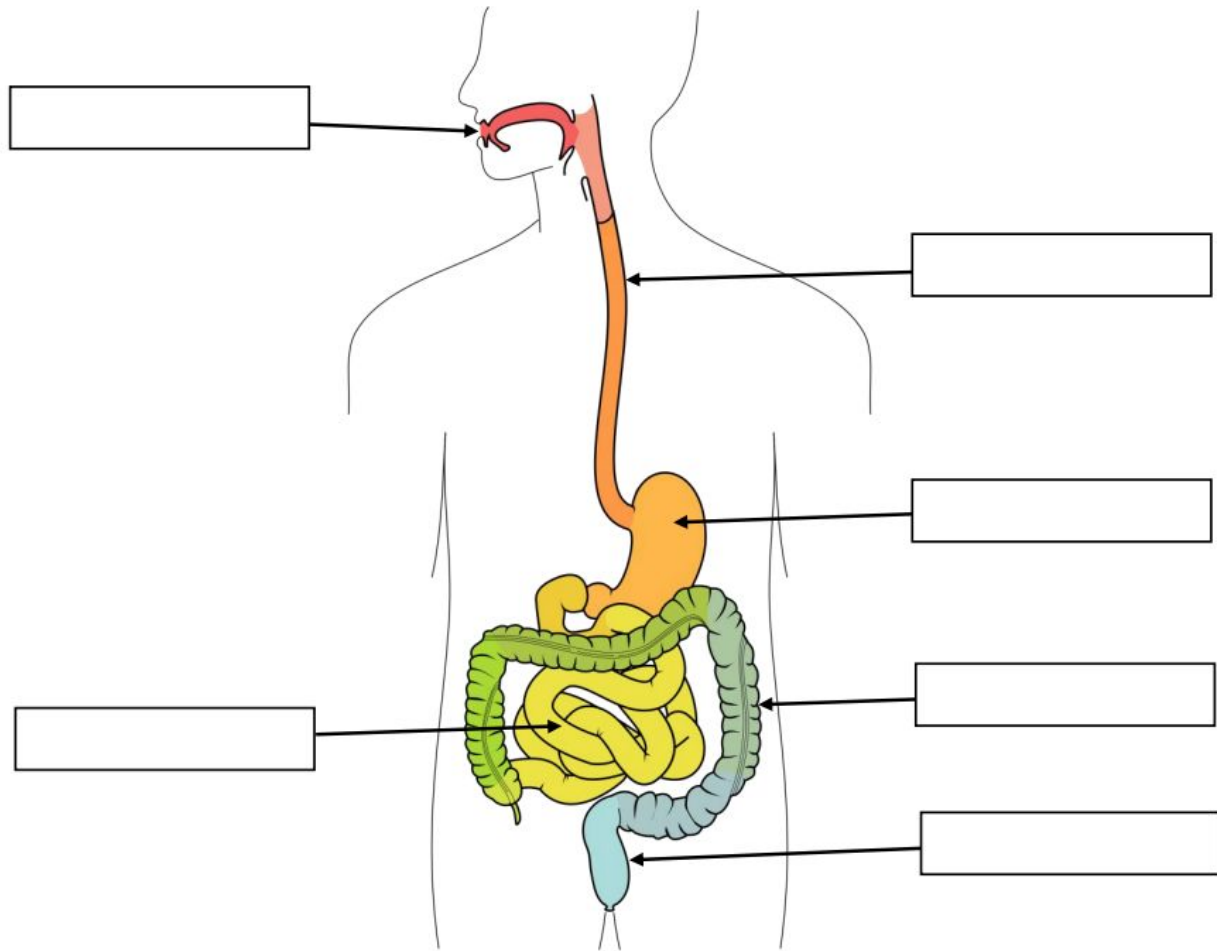
Cut a corner of the bag and pour the food into the intestine. As you squeeze the food through the intestines, all the nutrients that we need for growth and energy will flow into the tray which represents the body. The things the body can't digest will be left in the tights.

When the waist has solidified transfer it into a paper cup with a hole in the bottom, which represents the large intestine.

Use another plastic cup to push the waste through the hole this mimics the act of going to the bathroom.

Digestive System

Label the parts of the digestive system.



Small Intestine

Rectum

Large Intestine

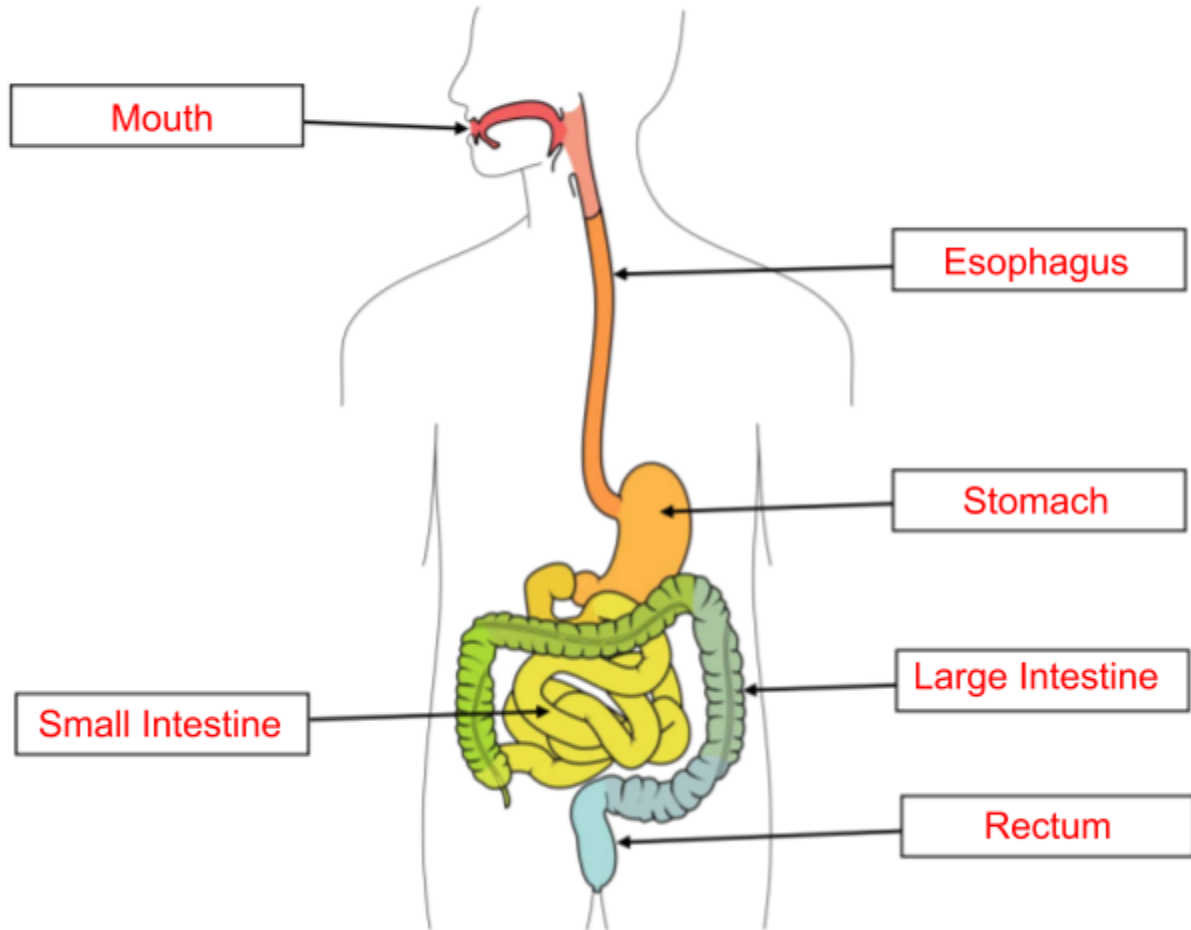
Mouth

Stomach

Oesophagus

Digestive System MEMORANDUM

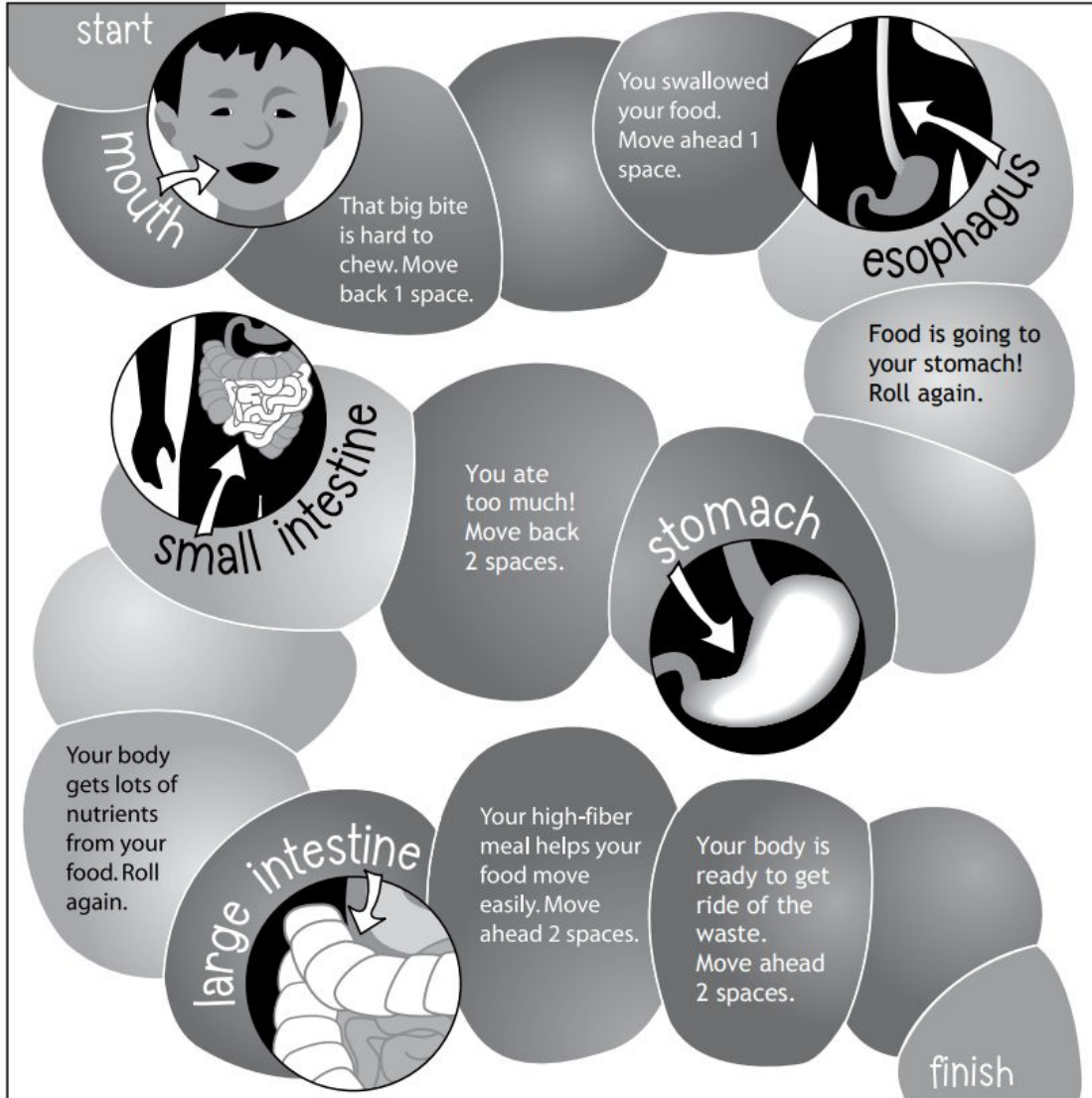
Label the parts of the digestive system.





Roll Through the Digestive System!

Instructions: First, you and a classmate should choose playing pieces and place them on the start line. Take turns rolling the dice. After rolling, move that number of spaces. Follow the directions on the space where you land. The first player to travel all the way through the digestive system to the finish line is the winner!



Print and cut to use instead of dice. Put two sets in each plastic bag.

1	2	3	1	2	3
1	2	3	1	2	3
1	2	3	1	2	3
1	2	3	1	2	3
1	2	3	1	2	3
1	2	3	1	2	3
1	2	3	1	2	3

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Lesson 1: The Scientific Method

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