**Unit: Human Respiratory and Circulatory Systems**

**Essential Question:**

How does what you eat affect your heart rate and your breathing?

**Unit Description:**

 This unit is the third unit of the year. The first unit was about two weeks at the beginning of the year, and introduced students to the scientific method, the different types of scientists, and attempted to break the typical stereotype of a scientist and show all students that they could be scientists. The second unit was about a month and a half learning about the human digestive system. The students were asked to learn about the structures and functions of the various parts of the system. They learned what enzymes digested foods in various parts of the digestive system. They also learned about diffusion across membranes. They performed these tasks using a variety of readings, labs, investigations, diagrams, vocabulary, and models. In the upcoming unit on the human respiratory and circulatory systems, the students will build upon their knowledge of scientific investigation and be asked to design their own experiment. They will also build upon their knowledge of human body systems by tying concepts such as diffusion and the products of digestion into the respiratory and circulatory units. This will be accomplished using similar methods as in the previous unit.

**Learning Goals for Unit:**

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| **Goal** | **Assessment** |
| Students will use a variety of models to represent the human respiratory and circulatory systems | Students will created, draw, label, and describe strengths and weaknesses of models of the various parts of the respiratory system. |
| Students will be able to identify the structures and functions of the respiratory system | Students will be able to label diagrams of the respiratory system and describe the functions of those structures |
| Students will learn about human lung capacity | Students will be able to explain a lab where they measure the lung capacity of themselves and their classmates. |
| Students will learn what happens when fuel combines with oxygen | Student will be able to explain combustion, oxidation, and cellular respiration, and describe the similarities and differences between them, as well as the inputs and outputs of cellular respiration |
| Students will understand food energy. | Students will be able to define calorie, and describe how they are measured, and in what units, as well as comparing the energy release of different foods |
| Students will be able to explain the structure and function of the human heart | Studnets will be able to draw the flow of blood through the human body, label the structures of a heart, and describe their functions. |
| Students will design an inquiry into the human heart | Students will design and conduct an experiment determining factors that affect the human heart rate |
| Students will investigate the conditions that affect blood pressure | Students will be able to explain what conditions cause an increase or decrease in blood pressure |

**Applicable Standards:**

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| 6-8 SYSA  | Any *system* may be thought of as containing *subsystems* and as being a *subsystem* of a larger *system*.  | Given a *system*, identify *subsystems* and a larger encompassing *system* (e.g., the heart is a *system* made up of tissues and cells, and is part of the larger circulatory *system*).  |
| 6-8 SYSC  | The *output* of one *system* can become the *input* of another *system*.  | Give an example of how *output* of *matter* or energy from a *system* can become *input* for another *system* (e.g., household waste goes to a landfill).\*a  |
| 6-8 INQA Question  | Scientific *inquiry* involves asking and answering *questions* and comparing the answer with what scientists already know about the world.  | *Generate* a *question* that can be answered through scientific *investigation*. This may involve refining or refocusing a broad and ill-defined *question*.  |
| 6-8 INQB Investigate  | Different kinds of *questions* suggest different kinds of scientific *investigations*.  | Plan and conduct a scientific *investigation* (e.g., *field study*, systematic *observation*, *controlled experiment*, *model*, or simulation) that is appropriate for the *question* being asked. Propose a *hypothesis*, give a reason for the *hypothesis,* and *explain how* the planned *investigation* will test the *hypothesis*. Work collaboratively with other students to carry out the *investigation*s.  |
| 6-8 INQD Investigate  | For an *experiment* to be valid, all (*controlled*) *variables* must be kept the same whenever possible, except for the *manipulated* (*independent*) *variable* being tested and the *responding (dependent) variable* being measured and recorded. If a *variable* cannot be *controlled*, it must be reported and accounted for.  | Plan and conduct a *controlled experiment* to test a *hypothesis* about a *relationship* between two *variables*. \*c Determine which *variables* should be kept the same (*controlled*), which (*independent*) *variable* should be systematically *manipulated*, and which *responding (dependent) variable* is to be measured and recorded. Report any *variables* not *controlled* and *explain how* they might affect results.  |
| 6-8 INQE Model  | *Models* are used to represent objects, events, *systems*, and processes. *Models* can be used to test *hypotheses* and better understand *phenomena*, but they have limitations.  | Create a *model* or *simulation* to represent the behavior of objects, events, *systems*, or processes. Use the *model* to explore the *relationship* between two *variables* and point out how the *model* or simulation is similar to or different from the actual phenomenon.  |
| 6-8 LS1A  | All *organisms* are composed of cells, which carry on the many *functions* needed to sustain life.  | *Describe* the *functions* performed by cells to sustain a living *organism* (e.g., division to produce more cells, taking in *nutrients*, releasing waste, using energy to do work, and producing materials the *organism* needs).  |
| 6-8 LS1C  | *Multicellular organisms* have specialized cells that perform different *functions*. These cells join together to *form* tissues that give organs their structure and enable the organs to perform specialized *functions* within organ *systems*.  | Relate the structure of a specialized cell (e.g., nerve and muscle cells) to the *function* that the cell performs. *Explain* the *relationship* between tissues that make up individual organs and the *functions* the organ performs (e.g., valves in the heart control blood flow, *air* sacs in the lungs maximize surface area for *transfer* of *gases*). *Describe* the components and *functions* of the digestive, circulatory, and respiratory *systems* in humans and how these systems interact.  |

**My 5 Lessons**

 The lessons shown in this unit plan are the first few lessons in the unit. These lessons will gather information about student preconceptions surrounding the human respiratory system, and then begin with an activity where the students construct a model of how human lungs work. The students will then be involved in a set of lessons which lead the students in investigating how much air a human can hold in their lungs, and then learn about the process of combustion and cellular respiration, and how the students use the oxygen they are getting from breathing. Following the lessons in the plan will be a set of lessons moving into the circulatory system. Students will complete a lab activity where they learn about how calories are measure, how much energy is in a variety of foods, and havea brief overview of the food pyramid. In the next lesson, Students will learn about the double-pump action of the heart using another model, determine the flow of blood through the heart, and study the structures of the human heart. At this point, the students will learn about how the food that they eat and the calories that they get are used in cellular respiration, and the oxygen they learned about during the respiration section are carried through the blood stream by the heart. In the next lesson, students will design an inquiry that explores what factors may affect the heart rate, and perform a reading about the importance of blood. Following this lesson, the students will use another model to explore how the diameter of a tube affects how hard a pump must work, and then relate this to the structure and functions of the heart, as well as blood circulation that they learned about in the previous units. Following will be a unit exam testing whether the learning objectives were met.

This is a unit that I implemented in collaboration with my Cooperating Teacher during my Student Teaching Internship. Many of these lessons and activities are based around activities that had been used in the past, along with some modifications and new ideas. This is a unit that was created following a set district curriculum based on a Human Body text selected by the district.

**Outline of the Lessons**

* Breathing Models
	+ This is the first lesson in the unit on human respiratory and circulatory systems. The lesson begins with students creating a class list of what they already think they know about breathing, allowing me to identify their preconceptions. They will then explore what happens when they inhale and exhale by first attempting to create their own model using a syringe and balloon. The students will then complete a reading about the process of breathing, and label diagrams of the respiratory system. Then they will recreate the syringe model, incorporating any new knowledge. Last, they will observe a bell jar model of breathing and compare the strengths and weaknesses of both the syringe and bell jar models. Later on in the unit, the students will return to the list of what they think they know about breathing, and have the opportunity to make any modifications or additions.
* Sponge Bob and Party Blowers
	+ Lungs have a large internal surface area mad up tiny sacs called alveoli, enabling them to hold large amounts of air. Students will explore various aspects of lung capacity during this lesson through two activities. In the first activity, students will measure the amount of water soaked up by a dry sponge, how much can be squeezed out, and determine the amount of water remaining in the sponge. The sponge can be compared to the branching alveoli in the lungs. In the second activity, students will use a bag graduated in liters to determine how much air they can breathe out, and then compare that to the average 6 liters lungs can hold.
* Respiratory Quiz
	+ This quiz will come at about the half-way point of the respiratory system. Using a word bank, students will be asked to label a diagram of the lung, as well as identify various structures and processes based on a description or definition. Students will then be asked to be reflective about their achievement on the test after grading has been completed.
* Trachea Transplant Article
	+ This can potentially be used at any point throughout the unit, though typically after some vocabulary and introduction has been done. Students will read a newspaper article about a trachea transplant, and learn about what science and technology can do for the health field.
* Candle Model
	+ This lab begins to introduce the concept of combustion through the burning of a candle, and has the students identify both the ingredients and products of combustion, which will be related back to oxidation and cellular respiration in future lab activities. The students will learn about the use of Bromothymol Blue as an indicator, including what it indicates for, and to see how it works so they understand the results they get in a later lab.
* Blowing Bubbles
	+ In the previous lab, students performed an experiment to learn about oxidation (combustion) in a burning candle. They lit the candle in a beaker with an indicator solution, and discovered that carbon dioxide, heat, and light are all products of combustion. In this lab, students will be breathing through a straw into a test tube and measuring the change temperature to discover that heat is a product of human oxidation (cellular respiration).
* Double Trouble
	+ In the previous labs, students identified the ingredients and products of combustion of a candle, and learned that heat is a product of cellular respiration by breathing into water and recording a temperature change. In this activity, students will use a breathing model to explore what gases are ingredients and products of cellular respiration by looking for evidence within the model. After this, they will be aware of two products of cellular respiration: heat and carbon dioxide.
* Why so Many
	+ This is another reading in a series of adventures that Peppi and Bollo go on in their journey through the human body. In this journey, Peppi and Bollo demonstrate why there are so many alveoli in the lungs by relating it to the vili that were discussed during the section on human digestion. They will also follow the path of oxygen and carbon dioxide through the blood stream.
* What a Gas
	+ Students will determine whether carbon dioxide can pass through a membrane through an activity that will provide evidence. They will pour carbonated water into a membrane and place in bromothymol blue solution. They will find that the carbon dioxide will diffuse through the membrane, demonstrated by a color change in the test tube outside of the membrane. In the body, oxygen and carbon dioxide are exchanged as blood circulates, and it is important that gases be able to easily cross membranes.