

# The Bod Machine

Christina Wilson  
7<sup>th</sup> grade Science

## **Subject Area Description**

I will be teaching at Madison Middle School in the Seattle School district. This school has a very culturally diverse population of students. It is also a mainstreamed school so I will have students with IEPs, 504 plans, ELL students, and students without these. This makes for a very rich learning environment.

This unit will be the first of the school year so they will not have any units I teach prior to this. From the 6<sup>th</sup> grade students will gain a basic sense of how science compares to their other classes of observing the natural world in order to make conclusions about it. They will have some skills in performing these tasks. Students will have a little experience with the scientific method, but it will basically need to be taught fresh. Students had units on animal classification which will help them in the comparative anatomy portion of this unit.

## **Essential Questions**

I have three essential questions that my students will be answering over the course of the quarter. Students will first ask *“Why is it that a candy bar looks different when it comes out of my body than when it goes in?”* This will get kids wondering about what happens to the food once it gets in their bodies. This question is answered by learning about the digestive system. They will learn the major organs of the system and what their specific function is. This will teach the students what is happening to food that makes it look differently when it comes out. Embedded in this we will be looking at the purpose of the digestive system- why does it make the candy bar look different which bring us to the next essential questions of *“Why is it that a candy bar makes me hyper?”* The purpose of the digestive system is to process matter and energy that enters the body into a form that can be used by the body. Students will learn about the forms of energy and matter that are used by the body (nutrients). Students will then learn about the circulatory system and how it is necessary for the nutrients that are taken up by the digestive system to circulate around the body to be used to build, repair, and maintain the body. These two questions will teach students about the anatomy and physiology of the digestive and circulatory systems and how energy and matter are used and given by a body. Finally students will take what they have learned from their last two questions to answer the third question of *“Does my pet, or my friend’s pet, deal with their food the same way that we do?”* This will lead students into their culminating assessment which requires them to do some comparative anatomy of the digestive and circulatory system in a variety of animals.

## **Learning Goals and Related Objectives**

- 1. Students will learn how the human body systems function in order to maintain life. (GLE 1.2.8)**
  - 1.1 Students will explain the functions necessary to maintain life (Altas CO).
  - 1.2 Students will describe the systems which perform the necessary life functions of circulation and digestion (GLE 1.2.6).
  - 1.3 Students will describe the organs in the digestive and circulatory systems and their functions (GLE 1.2.8).

1.4 Students will describe the relationships between the digestive and circulatory systems (GLE 1.2.8).

1.5 Students will compare the human body systems to other organism's body systems (GLE 1.2.8).

**2. Students will understand how matter and energy are processed by the body to build, maintain, and repair. (GLE 1.3.8, Atlas FE)**

2.1 Students will describe how food is broken down to a usable form by the digestive system (GLE 1.3.8, Atlas FE).

2.2 Students will describe how food particles enter the body to be used via diffusion and active transport across the intestines and blood vessels (GLE 1.3.8).

2.3 Students will describe how food particles are dispersed throughout the body via the circulatory system. (GLE 1.3.8)

2.4 Students will understand what type of food each kind of nutrient comes from and what it does to maintain life (source of energy or matter or both. (Atlas FE, GLE 1.3.8)

**3. Students will develop the skills and abilities needed to do scientific investigation. (EALR 2.1)**

3.1 Students will make hypotheses on not yet understood phenomena(GLE 2.1.2).

3.2 Students will conduct a scientific investigation (GLE 2.1.2).

3.3 Students will use observations and data to make a scientific conclusion (GLE 2.1.3).

3.4 Students will use models to explain scientific phenomena (GLE 2.1.4)

**4. Students will understand the importance of collaboration and sharing of ideas in the pursuit of scientific understanding and develop skills to do this. (GLE 3.2.1)**

4.1 Students will practice sharing the work equally in a group.

4.2 Students will learn that every person has valuable contributions which have and do further our understanding of science (GLE 3.2.1).

4.3 Students will practice listening and incorporating other's ideas to the task at hand.

UNIT PLAN: The Bod Machine

**Day 1: What do we need to live, and what in our body does this?**

1. What students are doing	<b>Hooking students.</b> Students will see pictures of different "machines" (a car, a sewing machine, etc). They will be given the definition of machine: a device with moving parts used to perform a task- Encarta dictionary. Students will explain what each of these machines do (their purpose, a little about how they do it, what they use as energy to do it). Then students will view a picture of a person and will think about whether this is a machine and what it might do if it is one (it let's us live, and an
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	<p>assortment of other things). <b>Eliciting student ideas.</b> Then, students will go into groups to answer this question: “What are the tasks that my body must perform in order to allow me to do what I need to do?” and will make a list of as many things that they can think of. <b>Guided exploration.</b> Then students will come together as a class and each group will share in order to compile a class list. Then students will go back in their groups and think about the human body and what in or about their body might be fulfilling the jobs of these necessary functions, recording their ideas on their poster. Students are not expected to have an understanding what each system does for their body, but this is to get them thinking about the idea that the things in their body aren’t just there, but help them to live and function. Students will be told that they will share their ideas in class tomorrow.</p>
<p>2. Objectives</p>	<p>1.1 Students will explain the functions necessary to maintain life (Altas CO). 4.1 Students will practice sharing the work equally in a group.</p>
<p>3. Reasons for content and instructional strategy</p>	<p>This content is presented to help students begin to think about their bodies and working systems. The fact that we need certain things to happen in order to stay alive gives context to the whole rest of the unit.</p> <p>Eliciting of student ideas is used here at the beginning to get student’s engaged with the topic. Students will be able to be in control of their own learning instead of having information shoved into their heads. The topic is also presented with ideas and things that students are familiar with (commonly used machines and their own bodies). This is a good level to begin a unit because students are able to immediately relate.</p> <p>The class sharing not only makes sure that the class is on the same page together and everyone is going in the same direction, but it also helps build a camaraderie in the class. They see that all their ideas were put together to form something that the class will use to go further in their learning. This is essential to begin our unit on the basis of having good group work and sharing of ideas among the class. The eliciting of student’s ideas helps contribute to this necessity since the learning is more student directed.</p>
<p>4. Evidence of understanding</p>	<p>Group lists will be collected for assessment of how deeply students were thinking and whether they were able to compile a list that made sense. Also, Much informal assessment will be done during the small group discussion and the large group discussion.</p>

5. Cultural Responsiveness	<p>Students are given the opportunity to engage with science because it will be accessible to them in terms of allowing them to use their own language, and it will be done using things that are familiar to them. The machines that will be chosen will be familiar to students of many cultures and backgrounds.</p> <p>Students will be working in small groups that will help them to develop relationships with each other. Good group work will be emphasized in this lesson since it is one of the objectives for the day. Students will also see that they are dependant on other groups to have a more full picture of scientific phenomena during the group discussion. Students will also have a shared experience with the list that they compile at the end.</p>
6. Resources	<p>Pictures of different machines Definition from Encarta dictionary</p>

**Day 2: How does our body let us do what we want, and keep us alive?**

1. What students are doing	<p><b>Guided exploration.</b> Students will retrieve their posters from yesterday and share out what their guesses are about what in their body performs each necessary life function.</p> <p><b>Just in time instruction.</b> Students will then watch a video of a survey on the human body systems. Based on what students just saw in the video, we will fill out our class list saying what in the body does what function. Some students might suggest that more than one system is involved in a necessary function or disagreement might occur. This idea will not be devalued, but pointed out and milked to invoke more thought from each student. Student will be asked to hold on to that question and for future discovery. <b>HOMEWORK:</b> Students will choose a given article on a disease of a certain human system. They will read the article and write a short summary and explanation of what happens when that system in our bodies doesn't work right.</p>
2. Objectives	<p>1.2 Students will describe the systems which perform the necessary life functions of circulation and digestion (GLE 1.2.6).</p> <p>4.2 Students will learn that every person has valuable contributions which have and do further our understanding of science (GLE 3.2.1).</p>
3. Reasons for content and instructional strategy	<p>Student sharing with class will help students to see that each person thinks of things in a slightly different way and this can help each person to understand science better regardless of whether that idea was right or wrong.</p>

	<p>Discourse to prove or disprove something as wrong or right is valuable to further one's own understanding. This will occur both in the discussion and with the help of the video. An understanding of what is required to maintain life and how the body does this is an essential idea that students will build off for the rest of the unit. If they don't know what the body needs and what generally does it, they can look deeper into certain systems with out it being decontextualized.</p> <p>This video is important here because it allows students to get the knowledge and understanding of what each system does for the body. The video will be more interesting than if I were to give a mini lecture on it and more information can come from the video if there are photos of the actual organs or systems in a body.</p>
4. Evidence of understanding	Homework will show if students understand the purpose and function of each system. Class list and discussion around that will also give teacher an idea of how the class is doing
5. Cultural Responsiveness	<p>Students will be able to watch a video which is a form of media that is comfortable to most students since most students watch TV and movies.</p> <p>Student ideas will also be very validated during the discussion of systems which will show students that all ideas are important to further understanding, even though they might realize they weren't correct in watching the video—the validation will be important here.</p> <p>Group work is also emphasized in this lesson which will help to improve or foster relationships between students of different backgrounds and social groups.</p>
6. Resources	Video on human body systems

**Day 3: Why does a candy bar look so different when it comes out of my body from when it went in?**

1. What students are doing	<p>This daily question (essential question #1) is posed to the class. Students will make a quick connection to how this is a necessary function done by a body system. Students will then begin to understand what is going on with this system. Students will view different animals—their diets and their poop. This will be funny and they will laugh, but will get the point that for every animal, food looks different when it comes out than when it went in. Students revisit the question. <b>Eliciting student ideas.</b> Students will then create a KWL chart on the digestive system. They will work on one individually then compile one as a class. <b>Interactive concept building.</b> Students will then be given</p>
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	a diagram of the digestive system that they will fill out as we discuss each part (over a few days). To start off with the learning of the digestive system, with the mouth we will do a short interactive concept building lesson on the mouth (covering both mechanical and chemical digestion) possibly on PowerPoint.
2. Objectives	1.3 Students will describe the organs in the digestive and circulatory systems and their functions (GLE 1.2.8). 2.1 Students will describe how food is broken down to a usable form by the digestive system (GLE 1.3.8, Atlas FE).
3. Reasons for content and instructional strategy	Students are again able to engage in their own learning by doing eliciting of student ideas in the KWL chart. This will allow all their thoughts and questions to be heard and will grow an excitement in them for the possibility of their questions being answered. Interactive concept building is then required to give students knowledge and understanding about the mouth. We are starting with the mouth since it is the first thing that begins the digestion of food.
4. Evidence of understanding	The KWL charts will be a perfect informal assessment for what students already know and what they don't know.
5. Cultural Responsiveness	Every student is able to interact with the idea of animals, food, and poop. All students have seen different kinds of animal poops. The idea of poop is funny and engaging to students. The KWL charts allow students to speak about the topic in their own language. This cuts down the need for unknown or unnecessary vocabulary.
6. Resources	Pictures of animals and poop.

#### Day 4: What is going on in my mouth, and in my tummy?

1. What students are doing	<b>Structured inquiry.</b> Students will be presented with an amylase/starch lab in order to observe chemical digestion in the mouth. Students will each receive a Petri dish with starch in the agar. Students will swab their mouth and swab the agar. Students will make if-then prediction statements on what they think will happen when the plates are later dyed with iodine. Plates will be incubated until next period. <b>Jigsaw groups.</b> Students will then begin their jig-saw groups that will each learn about one organ of the digestive system to teach the class. The KWL chart will be posted so that questions that pertain to each organ can be specifically looked at. They will have human anatomy books as resources to make a poster on their organ describing both the anatomy (placement in digestive
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	<p>system and appearance) and the function (what the organ does and a little bit of how if available). Students will describe the function of the organ by describing what it does to a piece of food. Poster must contain a piece of food that is being digested by the organ.</p> <p>Students will begin working on their poster and will finish it tomorrow.</p>
2. Objectives	<p>1.3 Students will describe the organs in the digestive and circulatory systems and their functions (GLE 1.2.8).</p> <p>3.1 Students will make hypotheses on not yet understood phenomena(GLE 2.1.2).</p> <p>4.2 Students will learn that every person has valuable contributions which have and do further our understanding of science (GLE 3.2.1).</p>
3. Reasons for content and instructional strategy	<p>Students are now able to interact with the science of what goes on in their mouth. This lab is directly followed after the instruction of the mouth so that they can see it in action. The jigsaw for the rest of the organs is necessary at the point to build a knowledge base for students to know what all makes up the digestive system and what each part does in order to make it perform the function that it does. This will allow students to move into deeper examination of the digestive system. Also, food is a required portion of their poster because students need to be thinking about the organs in terms of a process and not just a thing.</p> <p>The lab is done so that each student is able to interact kinesthetically in the class. The Jigsaw is done to both split up the work so that students are given a manageable amount of work, and jigsaws are very important for teaching students how to work in groups and how they need to learn from each other.</p>
4. Evidence of understanding	<p>The beginning of student posters will be analyzed to make sure that they are beginning to understand the function of that organ.</p>
5. Cultural Responsiveness	<p>All students will be a part of a shared experience since each student will have their own Petri dish and detecting the same thing.</p> <p>Students will be able to engage with science because they are testing their own body's ability to perform a necessary function. This is interesting to all students.</p> <p>Also, the beginning of jigsaws and explanation of jigsaws will show students that they can and will learn from each other. The opportunity to work as a group to perform a task that will be important to the class will hopefully help to build more camaraderie and relationships within the group.</p>

6. Resources	<a href="http://www.kabt.org/Labs/Amylase.htm">http://www.kabt.org/Labs/Amylase.htm</a> Materials for amylase lab Information on each organ for jigsaw groups
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**Day 5: What is going on with the other organs of the digestive system?**

1. What students are doing	<b>End of structured inquiry.</b> Students will receive their Petri dish and record their observations and results. We will talk about what happened in a class discussion and students will write a conclusion on what happened in the experiment and what they can conclude based on this about how the mouth is involved in digestion. <b>Jigsaw</b> Students will finish their jig saw posters for presentation tomorrow.
2. Objectives	2.1 Students will describe how food is broken down to a usable form by the digestive system (GLE 1.3.8, Atlas FE). 3.3 Students will use observations and data to make a scientific conclusion (GLE 2.1.3).
3. Reasons for content and instructional strategy	Students are now able to see the results of their experiment from yesterday and to analyze it. The analysis and conclusion is very important for student understanding of an activity. As much time spent on doing the activity should be spent on the analysis. The content of the jigsaw has students describing what each organ does to a piece of food helps them to see these organs or objects and part of a process. This takes emphasis from learning about objects and things to processes which is so much more interesting, engaging, and scientifically rich.
4. Evidence of understanding	The conclusion that students write for their experiment. The final posters of their organs will be observed for an informal assessment.
5. Cultural Responsiveness	Students again will be working in their jigsaw groups which helps them to see the importance of getting information from each other and practicing good group work skills. They will also get to see the results of how their own mouth functions which will provide access to science for all students.
6. Resources	Information on organs for jigsaw

**Day 6: What is going on with the other parts of the digestive system Part II?**

1. What students are doing	<b>End of Jigsaw.</b> Students will present their posters on their digestive system organ. As groups are doing this, students will fill out the rest of their diagrams explaining the name and function of each organ. Students will be encouraged to
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	<p>ask questions or the presenting group and others (not so much the teacher) about what they are hearing and additional thoughts that come up. <b>Digestion in action.</b> In the last part of class students will come together to act out the digestive system. Each student will be a part of an organ with props. <b>Final Assessment.</b> Students will be given and explained the first part of their final assessment (the digestive part). Students will choose the animal they will work with and begin finding information on their animal.</p>
2. Objectives	<p>2.1 Students will describe how food is broken down to a usable form by the digestive system (GLE 1.3.8, Atlas FE).</p> <p>4.3 Students will practice listening and incorporating other's ideas to the task at hand.</p>
3. Reasons for content and instructional strategy	<p>Students will be teaching each other during this time. The questions posed will be for those who are doing the teaching or of other groups. This will put the responsibility of learning on their classmates more than on me. This is a valuable aspect of learning that will be practiced on this day.</p> <p>Students will also be filling out their diagrams which will leave students with an understanding of each organ in the digestive system which gives them an explanation as to how the system does what it does. This will be a foundation that will be built off for the rest of the unit.</p> <p>The acting out portion of this lesson will allow students to compile all their understanding of what is going on in the digestive system and see it happen all at once and working together. This will also allow students to interact with the content in a new way.</p> <p>The final assignment is given on this day because the digestive system parts are finished so students are able to begin on their project.</p>
4. Evidence of understanding	<p>Informal assessment of discussion around organ parts.</p> <p>Formal assessment of finished poster.</p> <p>Informal assessment of student ability to act out their parts and integrate them with the other parts.</p>
5. Cultural Responsiveness	<p>Each student group is shown as the author of information for the class. This is empowering and important for all students to experience and they are able to during this lesson.</p> <p>The kinesthetic portion will allow students to interact with the digestive system in a new and possibly more comfortable way.</p>
6. Resources	<p><a href="http://www.accessexcellence.org/AE/AEC/AEF/1995/cave_dige">www.accessexcellence.org/AE/AEC/AEF/1995/cave_dige</a></p>

**Day 7: Why then does a candy bar make me so hyper? (Essential Question #2)**

1. What students are doing	<p><b>Quiz</b> on digestive organs given. Essential Question 1 is revisited by students. Students will discuss answers to the question based on what they have learned. <b>Interactive concept building.</b> Next students will be introduced to the next essential question. Students will have answered how the digestive system works, but now they will begin to see what it does for the body. Second Essential Question: “Why does a candy bar make me so hyper?” Students will attack this question by first looking at what makes up a candy bar and other foods. Students will do an activity where they are handed an envelope of puzzle pieces (laminated paper). Each puzzle piece will be named either an amino acid, glucose/fructose, fatty acids and cholesterol, or a vitamin. Students will work in pairs to put the puzzle together which will form the shape of a food that each of these building blocks mainly come from. This will be discussed in class and a list will be formed of nutritional items and examples of their sources.</p> <p><b>HOMEWORK:</b> Students will go home and record what they ate for dinner. They will classify these foods as sources of each of the building blocks suggested. If one of the elements was missing from their meal they will think of other examples of them either from in their home or outside their home.</p>
2. Objectives	2.4 Students will understand what type of food each kind of nutrient comes from and what it does to maintain life (source of energy or matter or both. (Atlas FE, GLE 1.3.8)
3. Reasons for content and instructional strategy	<p>In order to better understand the purpose of the digestive system, students need to know what food is broken down into. Students also should know where these items come from for their own health and body management (as well as a better understanding of what foods break down into what nutrients).</p> <p>This lesson is done via interactive concept building because they do not have enough of a basis or understanding of all the aspects of nutrition and where they come from. The short activity will help them to see this in a fun way and the explanations will make it more clear. Students also have a chance to discuss the ideas which allows the to interact with the ideas in another way.</p>
4. Evidence of understanding	The homework will show whether students understand the major kinds of nutrition and what kinds of foods they come from.

5. Cultural Responsiveness	For the homework, students are able to talk about food that they or their family eats and describe the nutritional value of it. This provides access to all students to scientific ideas. The puzzle activity allows students to interact with the ideas in a hands on way. The teacher explanations help students who are used to that instructional method.
6. Resources	Food puzzle pieces

(\*\*When actually teaching, do Nelly’s Nutritional lesson plan here to further understanding of nutrition and multicultural importance from EDTEP 586 website (saved on computer) (3day lesson))

**Day 8: “What do these things do once they are in my body?”**

1. What students are doing	Students will work in pairs to do a short reading on what certain nutrients are used for in your body (each pair will be assigned to a certain thing). Those students will make a poster on what they learned. Students will do a “wisdom walk” in which to learn about each nutrient. Students will fill out a worksheet using the information from the posters on what certain nutrients do in the body. We will gather back as a class to share things that were interesting to students or things that made them question more. Through a teacher directed analysis students will come to understand that each of these nutrients either serves to act as a building block for the body, or gives it energy to live. Students will then understand that it is from the food that we eat that we are able to grow and function. They will then discuss the answer to the second essential question. Students will then fill out the last part of the worksheet talking about this idea.
2. Objectives	2.4 Students will understand what type of food each kind of nutrient comes from and what it does to maintain life (source of energy or matter or both. (Atlas FE, GLE 1.3.8) 4.2 Students will learn that every person has valuable contributions which have and do further our understanding of science (GLE 3.2.1).
3. Reasons for content and instructional strategy	Students have learned in the previous lesson what nutrients come from what foods, but now they need to know what each of those nutrients does for the body. This lesson plan allows students to use reading in science class (a goal of the school since every teacher should develop reading skills of students). Reading science is different than reading any other text, and students should have

	<p>practice doing this. They are also using what they have learned to teach the other students about what they have learned. In order to teach the other students, students need to make a visualization of what they have learned, which shows their understanding even more. The worksheet is helpful to keep student's ideas clear and for them to know what is important to look out for.</p> <p>This lesson also is very important for teaching students how the body is dependant on the use of matter and energy from the food they get. This further explains the purpose of the digestive system.</p>
4. Evidence of understanding	<p>The worksheet that students fill out.</p> <p>The posters that students make</p>
5. Cultural Responsiveness	<p>Students are able to visually observe and learn about each nutrient which is comfortable fore many students. The content is also relevant to students because this way they will see why it is important to eat a certain amount of each kind of food. This provides access to the average person to science. Students are also seeing that they can be the creators of their own knowledge since they are learning and teaching each other.</p>
6. Resources	<p>Readings on each kind of nutrient</p>

**Day 9: Guided Inquiry Part I “What does the effects of food look like in a live organism?”**

1. What students are doing	<p><b>Rough draft of 1<sup>st</sup> part of final assessment due.</b></p> <p>Students will now do an investigation on Daphnia to see the effects of chemicals we eat on our activity (seen through heart beat of daphnia). Students will brainstorm a list as a class of chemicals that are added to our bodies that aren't among the list of nutrients we thought of the day before (caffeine, alcohol, dye, etc) in order to add to the possibilities of effects that we can look at. Students will have time to look at Daphnia under microscopes and observe their heart rate with no chemicals added to them. Here they will see what they look like and get familiar with their anatomy. Students will then create an initial model about what they think will occur when chemicals are added. This will be highly scaffolded by giving the students cut outs of the major components we are dealing with, to arrange on a poster. We will then work on a model as a class that we will use. Students will begin to think about which chemical they would like to test on the Daphnia.</p>
2. Objectives	<p>3.4 Students will use models to predict, investigate, and</p>

	<p>explain scientific phenomena (GLE 2.1.4)</p> <p>4.3 Students will practice listening and incorporating other's ideas to the task at hand.</p>
3. Reasons for content and instructional strategy	<p>The student brainstorming in the beginning allows students to add chemicals that are of interest to them. This will allow them to connect to the activity right away. Allowing students time to observe the Daphnia will allow them to first know what they are dealing with so that they can use this to plan their model. Students will also use their skills of microscopy and familiarity with Daphnia for tomorrow's lab.</p> <p>The purpose of using a model is to enrich the following inquiry. If students go into the investigation with an idea of the components that are involved and how they might be related, the scientific thought during and after the investigation will be much greater. Students will also see that they are able to explain scientific phenomena as scientists do.</p>
4. Evidence of understanding	<p>The model from each group</p> <p>Informal assessment of the class model that was developed.</p>
5. Cultural Responsiveness	<p>This lesson allows all students to discover a new creature together, creating a shared experience.</p> <p>Students are also able to choose a chemical that they are interested in seeing the effects of, which provides access to science for each student.</p> <p>The group work will help students to develop relationships with their group members because of a shared task and focus on group work because of the group work objective for the day.</p>
6. Resources	<p>Picture of Daphnia</p> <p><a href="http://www.umanitoba.ca/faculties/science/biological_sciences/lab12/biolab12_6.html">http://www.umanitoba.ca/faculties/science/biological_sciences/lab12/biolab12_6.html</a></p>

\*\*another lesson on modeling can be added here for further understanding and development of the idea, purpose, value, actual use, and limitations of modeling.

### **Day 10: Guided Inquiry Part II "What will happen to our Daphnia?"**

1. What students are doing	<p><b>Material &amp; Procedure</b> Students will decide on what they want to add to their Daphnia to see the change and form into groups based on what they want to look at. Students will be given options of chemicals (with the amounts given) (options will be caffeine, essential nutrients that we discussed earlier, alcohol or another depressant, and other options that students think of). Students will write hypotheses of what they think will happen. They will begin their investigation. Students will begin to take data</p>
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	<p>without the chemicals added in the data sheets they have been given. Students will then add their chemical and record the affect in heartbeat. Students will also take measurements after the addition. Repeat if needed. Students will have a worksheet of questions to fill out as they are doing this to keep them thinking about what is going on. Students will turn in their data to compile a class data sheet.</p>
2. Objectives	<p>3.1 Students will make hypotheses on not yet understood phenomena(GLE 2.1.2). 3.2 Students will conduct a scientific investigation (GLE 2.1.2).</p>
3. Reasons for content and instructional strategy	<p>Allowing students to be a part of developing the procedure and deciding materials gives a lot of autonomy that will be very helpful for students as they get nearer to an open-ended inquiry. Students will develop a written hypothesis in order to explain their prediction of what they think will occur. This is very valuable for students to go off what they made for their model and put their specific ideas (based on their own chemical) into written form. Students will then be able to conduct their experiment and collect their own data. This is a huge part of science and it is important for students to develop laboratory skills.</p>
4. Evidence of understanding	<p>Students will present their data as a sign that they were able to understand what they were doing and able to conduct the experiment well enough to result in data that makes sense.</p>
5. Cultural Responsiveness	<p>Allowing students to choose what they want to test provides access to science for them. This way they are able to do something unique that is of particular interest to them. Allowing students more autonomy that the first investigation shows them that they are able to be in control of their learning which is empowering to students.</p>
6. Resources	<p>Chemicals to test on Daphnia Daphnia Microscopes Petri dishes and other materials for handling Daphnia</p>

\*\*more time can be spent here with an additional day in order to explain and get into manipulated and responding variables.

**Day 11: Guided Inquiry Part III “How did putting chemicals in the water with Daphnia affect them?”**

1. What students are doing	<b>Analysis &amp; Conclusion</b> Students will analyze the data of the class set. Teacher will give them options of pre-made
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	<p>graphs to choose from to analyze. Students will then work in groups to look at the graphs and based on the data draw conclusions. Those conclusions of what chemicals did what to daphnia will be discussed as a class. <b>Interactive Concept building.</b> Students will be presented with the dilemma of how did these chemicals get into the Daphnia to affect it? Demo of a packet of starch in dialysis tubing is put into a jar of iodine and water. Students will see a similar reaction to their Petri dishes when the iodine goes through the dialysis paper and reacts with the starch. Students will be shown a close up picture of what dialysis tubing looks like and how it lets in the iodine. Diffusion will be explained here that iodine is small enough to fit through the holes. Students will be handed a worksheet that shows the picture of iodine going through the dialysis tubing as well as a picture of cell membrane (like Daphnia's). Also with this picture are structures of molecules (that we discussed earlier, sugar, vitamins, fats, water, and Iodine) in proportional sizes to the membranes. Students will be asked what can diffuse into Daphnia, and what cannot. Students will then be shown an overhead of human small intestine membrane and how there are special transporters for larger molecules. This is how we get big and small molecules through our intestines. Hmm... How does this explain what happened with our Daphnia in the different chemicals? <b>HOMEWORK:</b> Students will analyze their results from Daphnia based on this new information about diffusion in a worksheet. Also on the work sheet is a copy of their initial model. Students will write ideas about what should be changed based on their findings from the lab and their new understanding.</p>
<p>2. Objectives</p>	<p>3.3 Students will use observations and data to make a scientific conclusion (GLE 2.1.3).  2.2 Students will describe how food particles enter the body to be used via diffusion and active transport across the intestines and blood vessels (GLE 1.3.8).</p>
<p>3. Reasons for content and instructional strategy</p>	<p>Students will be asked to analyze their own findings and choose the graphs with which to analyze them. This allows students to be fully in control of their learning here, which will motivate them to think deeply about what is going on. The class discussion will allow all students to be on the same page about what the class thinks went on. Interactive concept building is necessary here for students to know why this happened. The why behind what happened is what makes this experiment so scientifically rich. Once they understand this content, they are then able</p>

	to apply it to the human body which is of most interest to the students (and helpful in answering our essential questions!)
4. Evidence of understanding	The worksheet homework Informal assessment of class discussions
5. Cultural Responsiveness	Students will be the authors of their knowledge as they do the analysis of their data. This is empowering for students. Students will finally get to do individual work while participating in a more instructive atmosphere during the interactive concept building. This is good for students who are overwhelmed with group work at this point.
6. Resources	None

### **Day 12: Guided Inquiry Part IV “How does stuff get in and around my body?”**

1. What students are doing	<p><b>Model revision.</b> Students will work in groups with their personal revised model to make one as a group. We will come together to revise our initial class model.</p> <p><b>Interactive concept building.</b> Students will be posed with the problem of Thyroid disease. Humans need iodine in their bodies to make a very important hormone, thyroxine, which is made in the thyroid gland. Thyroxine performs very important functions such as regulation of metabolism... Students will be asked: If we eat Iodine and it goes into our digestive system. How does it get from our small intestines down here, all the way up to our thyroid gland here? We know that Iodine can get across our intestinal wall, but then what? We need something to get the Iodine to our Thyroid or we are going to get a goiter! Students will be shown that the thing that will solve this problem of the digestive system is the circulatory system. Students will watch a Bill Nye video on the heart and circulation. Students will discuss in groups how they are now able to answer the second essential question. Some sharing out as a class will occur. Students will be given and explained the second part of the final assessment.</p>
2. Objectives	<p>3.4 Students will use models to explain scientific phenomena (GLE 2.1.4)</p> <p>2.3 Students will describe how food particles are dispersed throughout the body via the circulatory system. (GLE 1.3.8)</p>
3. Reasons for content and instructional strategy	The revision of the model is so necessary for better scientific understanding. In revising the model students are able to take their new conclusions and understanding and apply them to their previous ideas in order to improve

	<p>them. This shows students their growth in understanding and new ability to explain science better.</p> <p>The next portion is necessary for students to better explain the second essential question. Understanding the circulatory system and how it helps out the digestive system is crucial to a deeper understanding of the body. This is done through interactive concept building because it is information that students should not already know, so the information will be given to them.</p> <p>Also, students are finally able to answer the second essential question. This shows them that they have progressed!</p>
4. Evidence of understanding	<p>Group models and class model.</p> <p>Questions from Bill Nye on circulatory system</p>
5. Cultural Responsiveness	<p>The ability for students to see how they have improved their understanding of science and are able to share that with others (through the visual model) is empowering. The media of a video is accessible to most students (except maybe ELL students). Bill Nye is always interesting and engages students providing access to science for them.</p>
6. Resources	<p>Info on Thyroid disease  <a href="http://kidshealth.org/teen/diseases_conditions/genetic/thyroid.html">http://kidshealth.org/teen/diseases_conditions/genetic/thyroid.html</a>          Bill Nye video on Circulation</p>

**Day 13: “How does the circulatory system work and how is it connected to the digestive system?”**

1. What students are doing	<p><b>Structured inquiry.</b> Students will dissect a worm or frog in order to see the digestive and circulatory systems (virtual or real) and how they interconnect. Through this students will have a new and real life visual of the two systems. Most importantly students will visually see how the systems are interconnected. Students will have a worksheet of observations that they will fill out during the dissection that will help lead them to these conclusions.</p>
2. Objectives	<p>1.4 Students will describe the relationships between the digestive and circulatory systems (GLE 1.2.8).          1.3 Students will describe the organs in the digestive and circulatory systems and their functions (GLE 1.2.8).</p>
3. Reasons for content and instructional strategy	<p>This dissection will allow students to see all that they have learned in a real life organism. This will both be interesting, but also very valuable to further their understanding of the concepts presented.</p>

	In the organism, the connection between the two systems will be very easy to see, so it will take what is in their heads and provide a picture or visualization of it for them. The worksheet will help them to process what they are seeing as they do the dissection, deepening the scientific content of the study.
4. Evidence of understanding	Worksheet on dissection
5. Cultural Responsiveness	The option to choose between a real or virtual dissection will be more sensitive to each student's beliefs. The dissection is very interesting to them and can provide access to science for them.
6. Resources	Dissecting tools Dissection animal

**Day 14: "How are systems in the body interconnected?"**

1. What students are doing	Rough Draft is due this day. <b>Analysis of dissection.</b> Students will finish their conclusion worksheets on the dissection. Students will engage in a short discussion on the interconnection of the two systems. <b>Acting out the digestive and circulatory systems together.</b> Students will re-enact the digestive system like before, but also with the circulatory system involved, emphasizing the interconnection between these two systems. The initial list of body requirements and systems that do this will be revisited and students will discuss in small groups which other systems may be interconnected to our two systems and maybe on each other. They will record this on the copies of the list from before.
2. Objectives	1.4 Students will describe the relationships between the digestive and circulatory systems (GLE 1.2.8). 4.3 Students will practice listening and incorporating other's ideas to the task at hand.
3. Reasons for content and instructional strategy	The first part of the class allows students to finish the analysis of the dissection which is a very important part of the dissection. It also allows them to focus on the questions without the distraction of the animal right in front of them. The final acting out of the systems will help students relate what they learned in the beginning of the unit to the new understanding. It will also help students to relate the two systems together. Revising the first list of systems will help students to display transfer of ideas from the digestion-circulatory connection to other possible interactions between systems. This is also done in groups to allow students to be in

	charge of their own understanding.
4. Evidence of understanding	List of systems with explanations of their interconnectedness. Worksheet of dissection analysis
5. Cultural Responsiveness	The movement activity will engage students that may not otherwise be as engaged. Students are again asked to be the authors of their knowledge which affirms and empowers them and their ability. The group work and emphasis on this will help build relationships between students
6. Resources	Materials for the acting out of the systems

**Day 15: Final essential question. “Does my pet process food the same way that I do?”**

1. What students are doing	Final Draft due this day. Students will present their final work pointing out the unique things about their animal and how it differs from a human. Students will be encouraged to make this a discussion, asking questions and making comments to connect ideas. After the presentations are done, students will engage in a discussion to answer the final Essential Question.
2. Objectives	1.5 Students will compare the human body systems to other organism’s body systems (GLE 1.2.8). 4.2 Students will learn that every person has valuable contributions which have and do further our understanding of science (GLE 3.2.1).
3. Reasons for content and instructional strategy	The final presentation will allow students to learn about the different animals that they didn’t study. This is essential for the comparative anatomy portion of this unit. The purpose of having be a discussion as it happens will keep students thinking critically during the discussion. The final answer to the last essential question will finally wrap up all that they have learned.
4. Evidence of understanding	Presentation of their final work Informal assessment of the discourse that occurs
5. Cultural Responsiveness	Students will be able to present a finished piece of work to the class. This should be affirming and empowering as they teach the class something that they uniquely know about (their own animal).
6. Resources	None.