The Digestive System
Where Does Your Food Go?

What a Long Strange Trip it is

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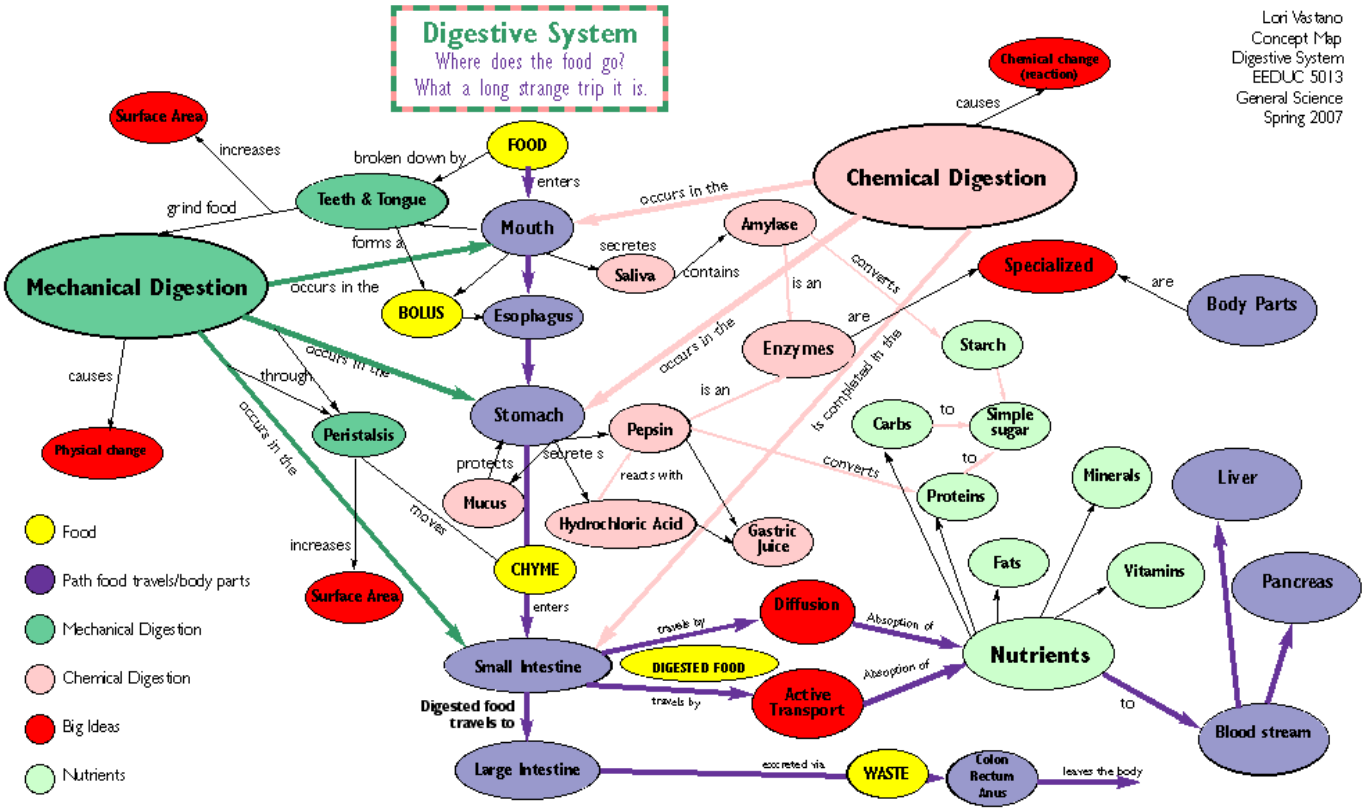
EEDUC 5013
Spring 2007


Digestive System
Where does the food go?
What a long strange trip it is.
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Concept Map
Digestive System
EEDUC 5013
General Science
Spring 2007
Chemical change (reaction)
causes
Surface Area
increases
broken down by
FOOD
enters
Chemical Digestion
occurs in the
Teeth & Tongue
grind food
Mouth
Amylase
secretes
forms a
Saliva
contains
Mechanical Digestion
occurs in the
BOLUS
Esophagus
is an
converts
Specialized
are
Body Parts
Enzymes
are
Starch
occurs in the
occurs in the
is completed in the
causes
through
occurs in the
Stomach
is an
Pepsin
Carbs
to
Simple sugar
Physical change
Peristalsis
protects
secrete s
converts
to
Proteins
Minerals
Liver
Mucus
reacts with
Hydrochloric Acid
Gastric Juice
moves
increases
Fats
Vitamins
Pancreas
CHYME
Surface Area
enters
Diffusion
travels by
Absorption of
Food
Path food travels/body parts
Mechanical Digestion
Chemical Digestion
Big Ideas
Nutrients
Small Intestine
DIGESTED FOOD
Nutrients
Absorption of
Active Transport
travels by
to
Digested food travels to
Blood stream
Large Intestine
excreted via
WASTE
Colon Rectum Anus
leaves the body

Concept Map

Unit Introduction:

This unit is part of a wider biology unit - The Human Body. *"Where does your food go?- What a long strange trip it is"* is a focus on the Digestive System. Most of the lessons are extracted from the Science and Technology Concepts for Middle Schools™ - *Human Body Systems* curriculum kit. *The Digestive System* is Part 1 of 3 Parts. Parts 2 and 3 are, *The Respiratory and Circulatory Systems* and *The Musculoskeletal System* respectively.

Students will investigate what happens to food, from the moment we put it in our mouth to how it is metabolized in our body. Benchmark lessons to review what a chemical reaction is, why and when we conduct tests will be conducted prior to two of the activities. Students will conduct chemical tests, which will provide the knowledge needed for the culminating activity. *Students will design a healthy meal that includes the 3 main food groups. They willdesign an experiment which requires the testing of, starche, sugar, protein, fat and Vitamin C*. They will create an advertisement to advocate their healthy snack.

Overarching Goal of Greater Unit - The Human Body:

Students will understand that the living human body is a complex system of specialized systems, which interact with each other.

Mini-unit Understanding Goals:

- Students will understand that we get our energy from food.
- Students will be able to state the route food travels through the digestive system.
- Students will understand the difference between chemical and mechanical digestion.
- Students will understand the importance of eating a healthy, well-balanced diet.

Brief Description of Group to be Taught: The class sizes are aproximately 20 eighth grade students. I will be teaching one class of high achieving students and two with more diverse abilities. The unit could be adapted to any middls school grade.

Science module: *Human Body Systems*, the Science and Technology Concepts for Middle Schools™ Curriculum (National Academy of Sciences, 2000).

Unit Length: 3-4 weeks

Massachusetts Frameworks Strand and Learning Standards:

Life Science
Systems in Living Things:
6. Identify the general functions of the major systems of the human body (digestion,…) and describe ways that these systems interact with each other.

Chemistry:
Elements, Compounds, and Mixtures
10. Differentiate between physical changes and chemical changes.

Other Content Area Frameworks

Health:
By the end of grade 8 - Through the study of Body Systems students will:
Explain the function of human body systems and how body systems work together
Apply skills that increase immediate peak functioning of body systems (vigorous exercise, eating nutritious foods, adequate rest)

Food and Nutrition Services
Display educational posters around the cafeteria explaining benefits of fruits, vegetables, and grains. (*Massachusetts Comprehensive Health Curriculum Framework* October, 1999. P. 21)

(Nutrition addresses the development of a healthy body composition through the balance of food intake and physical activity and the relationship between food sources and behaviors and growth, current health needs and chronic disease, and healthy behaviors. (*Massachusetts Comprehensive Health Curriculum Framework* October, 1999. P. 24)

Language Arts:
Standard 1: Discussion
Students will use agreed-upon rules for informal and formal discussions in small and large groups.
Standard 2: Questioning, Listening, and Contributing
Students will pose questions, listen to the ideas of others, and contribute their own information or ideas in group discussions or interviews in order to acquire new knowledge.
Standard 3: Oral Presentation
Students will make oral presentations that demonstrate appropriate consideration of audience, purpose, and the information to be conveyed.
Standard 4: Vocabulary and Concept Development
Students will understand and acquire new vocabulary and use it correctly in reading and writing.

FOUNDATION LESSON:
Mystery Powders - Using Reagents for Testing Substances - three to four days
I decided that this lesson needs to be taught earlier in the year. It doesn't relate enough to this mini-unit enough to justify the time needed to do this properly. It is absolutely necessary however that students have experience with properties of substances prior to the lesson below. A Benchmark lesson is included to remind students of this experience and for relating it to the new labwork. It was through my experience teaching the Digestion in the Mouth and Stomach Lessons that I realized students were having difficulty understanding the why and what of chemical tests. I therefore added the benchmark lesson in Lesson 2.

List of Lessons

Discrepant Event - *Totally Magnetic Food* - one day
Driving Question: *Where does your food go?*
Lesson 1 - *Destination - Healthy Body* - How food moves through the digestive tract - two days
Lesson 2 - Benchmark lesson - instruction on procedure for testing substances - segue into *Pass the Carbs Please* - Exploring Carbohydrates - Testing for Sugar and Starch - two days.
Lesson 3 - *Take a Bite!* - Digestion in the Mouth - two days
Lesson 4 - *A Hunk, a Hunk of Churning Chyme* - Digestion in the Stomach - two days
Lesson 5 - *Getting From Here to There*- Diffusion and Active Transport - two days
Lesson 6 - *Design a Healthy Snack* - Culminating activity - five days

Discrepant Event - Totally Magnetic Food

Description: A magnet is used to remove particles of iron from Total® breakfast cereal. Students should be surprised that the same type of iron in a nail or screw is the same iron that is in our food.

This lesson was described as a teacher demonstration. It could also be conducted in groups. The cost would quadruple since it requires a full box of cereal. I decided the activity will be more interesting if the students participated.

Materials:
- Total® brand cereal, or other high iron content breakfast cereal
- mixing bowl
- plastic or glass rod
- large spoon
- magnets
- zip type bags (optional)

Total® brand cereal is crushed into pin-head size pieces, mixed with water, and stirred. With the magnet attached to the rod, stir the cereal mixture for several minutes. Bits of iron will collect on the magnet. (Variation: Use a Ziploc® bag to crush and mix cereal and water, and hold magnet outside of bag. Iron should collect near the magnet inside the bag. Students will need a clear view of the demonstration. For this reason I would prefer for students to conduct the demonstration with me.

TIME	PROCEDURE
Prep	Purchase enough boxes of Total cereal for teacher and each group of students. Place metallic objects such as nails, screws, etc. on desks/tables.
Day 1 20 min.	**Introduction:** Students will find nails, screws and/or metal filings on their tables. Ask them if they would like to eat any of these delectable morsels. Begin demonstration and ask students to calculate how much iron per serving as stated on box. After the iron has been separated from the cereal, divide it into the

	number of servings per box.
Day 1 10 min.	**Summary:** Say we don't eat nails, etc. but we do eat foods that contain the same substance as nails - iron. What do you know about what is in food? What kinds of food do you know are healthy? Unhealthy? Explain that the next few weeks we will investigate why we need certain foods by answering the question Where Does Your Food go?

15 min. KWL Stretegy:

Ask students to write down the path of the digestive system under What They Think They Know

Write down what they want to know - Share responses with class.

At end of unit revisit and ask students to write down what they learned. They should be able to follow the path food takes from the mouth to intestines. This material will be covered on a test.

Content: Explain the importance of iron in our diet, which functions require iron for healthy living, etc.

Understanding goal from this demonstration: Students will understand that the iron in cereal is the same as iron found in nails, etc.

Segue into unit and driving question (logic):
Iron is absorbed by the body by a series of processes in our digestive system.
Iron is an important mineral.
Minerals are one type of food important to our health.
The main types of foods are; carbohydrates, proteins, fats, vitamins, and minerals.
Students will explore which types of foods are in the kinds of food we eat and how our body digests these foods.
By following the path our food takes students will understand the processes of digestion and why eating the right foods is important for health.

Students may refer back to this demonstration for the culminating activity when they will choose a healthy snack and prove that it is healthy by designing a test or tests based on what they have learned.

Provide an outline of the Unit with deadlines and expectations. Send a letter home to parents which explains the final project and the students responsibilities.

Lesson #1
A Long and Winding Road
How Food Travels Through the Digestive Tract

Relationship of this Lesson to the unit: This lesson is Lesson #2 of the Science and Technology Concepts for Middle Schools™ - *Human Body Systems* curriculum kit. In this two-day introductory lesson, students will gain the foundation for the lessons that follow. The driving question is answered in part by the investigation of the route that food travels through the digestive system, thereby learning which organs are involved, what peristalsis is and the purposes of the digestive processess.

Understanding Goal:
Students will understand that mucus is an important substance in the digestive system.
Students will understand that the digestive system is about 8-10 meters long.

Science Concepts:
- Food passes through the digestive system by the process of peristalsis.
- Food must be broken down mechanically and chemically before it can be metabolized.
- Mucus lines the digestive tract to help the food pass through it and to protect its inner walls.

Science Habits of Mind:
Work cooperatively in a group.

Science Processes: Define Operationally - Students create a definition of peristalsis by participating and observing a hands-on activity that simulates food traveling through the digestive system.

Lesson #1 Materials for Class:

For the Teacher:
1 trash bag
1 container of vegetable oil
2 pieces of newsprint or transparencies (not included in kit)
1 black marker
Transparency which depicts how to mark tubing. (Create from teacher guide)

Lesson #1 Materials for each Group:

For each group of 4 students (materials are provided in a box with lid):
1 poly vinyl tubing, 9.3 m
1 pair of scissors
1 black marker
1 tennis ball (soaked in vegetable oil and placed in a small plastic storage bag with fold-and-close top)
1 plastice storage bag with fold-and-close top
1 measuring tape, 150 cm
1 plastic resealable storage bag, large, 22.9 x 30.5 cm (9" x 12")

Session Length: Two 45-minute sessions.

Activity summary: Inquiry: Moving Right Along (STC-MS title)

Students use a long, clear tubing and a tennis ball to simulate food traveling through the digestive tract. The ball is soaked in oil to simulate mucus. Students measure each part of the digestive tract and then try to move the ball inside the tubing. Students learn how long the digestive system is and the importance of mucus in this inquiry.

TIME	PROCEDURE
Prep	Prepare transparency and have ready. Write the following questions on newprint or board, leaving spaces for student responses. How do you think food moves through the digestive tract? What do you think happens to food as it moves along the digestive tract? Why do you think the digestive tract gets narrower at some places? *This is similar to the KWL strategy without the What do you want to learn? component. Since this is the introductory lessson I am adding the question,* What do you want to learn about the digestive system?
Day 1 15 min.	**Introduction:** Instruct students to brainstorm for a few minutes to answer the questions posted. They should write the questions and answers in their science journals. Ask the Reporter from each group to share their group's responses. Teacher records answers with posted questions.
Day 1 10 min.	Introduce the activity. Ask students to follow along while you review the procedure in Chapter 2 of the Student Guide.The kit provides clear step-by-step instructions in the student guide. Reiterate to students to allow each member of the group to squeeze the ball through the tubing about 2 m each to allow each person the opportunity to participate.
Day 1 15 min.	**Begin Inquiry:** Have getters get materials. Proceed with activity. Students begin by measuring the tubing which should take up the rest of class time.
Day 1 5 min.	**Clean up and Assign Homework:** Read "Spies: All Systems Go!" included at the end of Lesson 2 in Student Guide. Hand out reading activator.
Day 2 5 min.	Review the procedure for the inquiry. Assess where each group is. Remind students to consider the questions, What does the tennis ball represent? And Why do you think the tennis ball was soaked in oil? While they conduct the activity.
Day 2 25 min.	Students work on activity. Walk around room to assess group dynamics and to offer any help. This is a good time to display a sample of measured tubing on the classroom wall so students can refer to it during the inquiry and throughout the unit.
Day 2 10 min.	**Reflection:** Discuss the answers to the questions: How do you think food moves through the digestive tract? What do you think happens to food as it moves through the digestive tract? Why do you think the digestive tract gets narrower at some places?What does the tennis ball represent? Why do you think the tennis ball was soaked in oil? How is the tennis ball different than actual food as it moves

	through the digestive tract? Ask students to consider what they would like to learn about the digestive processes, the organs of digestion, and food and nutrition.
Day 2	**Assign Homework:** Students should read "Nutrients: You Just Can't Live Without 'Em" which is included in the Student Guide. Hand out Venn Diagram which they should fill out in response to the information from the text.

If there's time and/or if groups finish before end of period: Students can visit this site with animation showing the parts of the digestive system. "The Real Deal on the Digestive System" at http://www.kidshealth.org/kid/body/digest_SW.html (There needs to be a few computers in the room).

Assessment: Students are graded on how they work in a group, contributed to class discussion and by the effort and extent to which they added written information in their science journals.

Lesson #2
Benchmark Lesson - How and Why WeTest for Substances
Exploring Carbohydrates - Testing for Sugar and Starch

Relationship of this Lesson to the unit: This lesson is extracted from Lesson 3 of the *Human Body Systems*, the Science and Technology Concepts for Middle Schools™ curriculum. This lesson drives home the message that carbohydrates are a major source of energy. Through a hands-on science investigation students will learn how to test foods for sugar or starch. By testing foods for sugar and starch students become familiar with Lugol's and Benedict's Solution, and how to perform tests. The following lesson builds on this lesson by investigating digestion in the mouth. Students need this foundation lesson in order to proceed with the unit.This helps to answer the driving question indirectly by providing knowledge about carbs.

Understanding Goals:

- Students will understand what carbohydrates are and the forms in which they are found.
- Students will understand why and how to perfom chemical tests to determine the presence of sugar and starch.
- Students will be able to explain why we need carbohydrates.

Science Concepts:
- Substances react predictably when mixed with another substance.
- Carbohydrates are one of the three main food groups.
- Sugar and starch are carbohydrates.

Science Processes: Collecting data

Science Habit of Mind: Keep records of investigations and observations and do not change the records later.

Materials for Teacher:
1 Food-Testing Master Chart (included in kit) for overhead projector

Materials for each student:
1 copy of Student Sheet 3.1a: Food-Testing Data Sheet (included in kit)
1 copy of Student Sheet 3.1b: Venn Diagram: Carbohydrates
Safety Goggles (not supplied by kit)

Materials contained in box with lid for each Group of 4:
- Sugar solution in dispensing bottle
- Mini Marshmallows
- Potato Buds
- Powdered Egg Whiltes
- Cornstarch
- Dropper bottle of distilled water labeled DW, 125 mL (not provided by kit)

- 2 Dropper bottles of Lugol Solution, 7.5 mL
- 2 Dropper bottles of Benedict's solution, 30 mL
- 2 test tubes
- 1 6-hole test tube rack
- 2 6-cup labe trays
- 3 scoops
- 8 toothpicks
- 2 black markers
- 2 plastic pipettes

Session Length: Two sessions.

TIME	PROCEDURE
Prep	Distribute materials equally among covered boxes supplied by the STC-MS Kit. Place a covered box at each group's table. Make copies of the handouts for each student. Prepare two test tubes that show a positive test for sugar and one that tests negative for students to reference during activity. Hang Food-Testing Master Chart.
Day 1 15 min	Benchmark lesson on how and why we test for substances. Begin by reminding them about the mystery powders activity earlier in the year. What happened when you added ——— to ——— ? Explain that we can test foods to find out what type of food is in them. Certain substances react predictably when another is added to it. These are called chemical tests. There are different chemical tests for the different types of food, protein, carbohydrate, sugar and starch, etc. When we perform each test there are specific procedures we must follow. In order for the test to be successful, it is important to follow the directions carefully. Let's begin the next activity.
Day 1 10 min.	Read Introduction in Lesson 3 p. 14 of Student Guide. Read along and explain how to use a water bath. Firmly explain safety rules of using water bath. Read through the materials list, the safety tips and review how to perform test for sugar and starch. Although the book asks students to work in pairs, students will be working in groups of four for this activity. Since there is little time remaining for this class period suggest that students perform the starch test first. Remind students what a control is. Express the importance that they will be graded on how well they collect and record the information from the inquiry.
Day 1 15 min	Getters get safety goggles. Students begin activity. Walk around to assess group dynamics.
Day 1 5 min.	Clean up
Day 2	**Prep:** Water bath needs to be turned on. Ensure there's enough test tubes, etc. Prepare clean up procedure. Prepare transparency of Venn Diagram
Day 2 30 min.	Students should begin inquiry where they left off. Remind them of safety and clean up procedures. Show them the Food-Testing Master Chart and explain that the recorder should add the group's results to the chart when finished. They should

	clean up when finished and complete charts, answer questions and write in journal.
Day 2 10 min	**Summary and Wrap-up:** Once all students have completed the activity discuss the results that have been posted on the Master Chart. If there are discrepancies brainstorm why that might have happened. Remind students not to change their evidence if it was not correct, but they should understand why certain foods tested positive or negative for sugar or starch. Show blank Venn Diagram on overhead and ask students to share their homework responses while writing on overhead.
Day 2	**Homework:** Read introduction and procedure for Lesson 4

Assessment: How students participate in discussion, anectodal notes during lab, Venn Diagram and Lab Chart with questions.

Lesson #3
Take a Bite!

Relationship of this Lesson to the unit: This lesson is from Lesson 4, page 24 of the *Human Body Systems,* the Science and Technology Concepts for Middle Schools™ Curriculum (National Academy of Sciences, 2000). This is the third activity in a series of lessons focusing on the digestive system. This lesson expands the knowledge of testing substances that students gained from the previous lesson. Take a Bite! Students begin to investigate the processes of digestion beginning in the mouth, hence addressing the driving question. Important vocabulary words will be introduced in this lesson.

This lesson precedes the lesson on stomach digestion. The knowledge and content in each of the lessons in this unit build on each other. At the end of the unit students will have gained enough knowledge of testing procedures to design their own experiment.

Understanding Goals:
- Students will understand when digestion begins.
- Students will understand the difference between chemical and mechanical digestion.

Science Concepts:
- Mechanical digestion begins in the mouth and is the process by which the teeth and tongue break up food.
- Chemical digestion begins in the mouth and is the process by which the enzyme amylase begins to chemically break down starch into sugar.

Science Processes: Define operationally - Creating a definition (students will begin defining what an enzyme is)

Science Habit of Mind: Be curious. Be careful and accurate in observations.

Activity #3 Materials for Class:
- Appetizing pictures of food
- crackers

Activity 3 Materials for each Group:
- 1 tote tray which includes inside:
- 2 dropper bottles of Benedict's solution
- 2 dropper bottles of Lugol solution
- 2 dropper bottles of salivary amylase
- 2 dropper bottles of distilled water
- 2 dispensing bottles of starch solution
- 2 medium test tubes
- 1 test tube rack
- 2 test tube clamps
- 2 6-cup lab trays
- 2 plastic pipettes

- 8 toothpicks
- 2 back markers

Session Length: Two sessions.

TIME	PROCEDURE
Prep	Totes need to be stocked and placed at each group Overhead transparencies Crackers in containers for each group Make copies of student Chemical Testing for Sugar and Starch.
Day 1 5 min	**Discussion/Observation:** 1. Ask students if they're hungry. Start talking about food, be descriptive show appetizing photos of food to get them to salivate. Direct students to conclude their mouth waters.
Day 1 10 min	**Observation:** 1. Have getters get crackers. 2. Instruct them to observe what happens while the cracker is in the mouth, including swallowing. 3. Students should write down their observations in their journals and make inferences, ask questions they might have. 4. Students and teacher have a discussion by sharing their observations - teacher writes notes on paper or overhead 5. This session ends when students conclude that saliva has something to do with the digestion that's going on in the mouth.
Day 1 25 min	**Activity Test for chemical reaction** 1. Reflect on previous test for sugar and starch 2. Introduce the next investigation by saying you are now going to explore what happens in your mouth 3. Review safety and clean-up procedures 4. Read Student Guide for investigation procedure. 5. **Model** chart making on overhead (kit provides an unfinished chart) 6. Materials will be on the table. Students should take inventory to make sure they have all the ingredients. 7. Explain that this investigation is a simulation of chemical digestion in your mouth. 8. Introduce the substance amylase 9. Ask them to think about what amylase is 10. What do you think amylase will do when you mix it with the starch solution? 11. Tell them to begin investigation 12. Walk around and assess group dynamics, proper procedure, etc. 13. Students are required to fill in the Chemical Testing for Sugar and Starch chart and answer the questions. Students pass these in to be graded. This sheet will be included in their science journals.
Day 1	**Clean-up:** Clean-up procedures are the same as the last investigation

5 min	**Homework:** Read "Spies: Into the System" Provide a hand-out that includes questions to help the reader focus on the important points in the text.
Day 2 20 min	**Finish or Redo:** ▪ Reflect on previous day's investigation. ▪ Allow any teams to finish or redo their lab. ▪ While some groups are finishing the others can be completing their lab journals, finishing homework or fulfilling a classroom job ▪ Teacher can use this time to give extra guidance to students who need it.
Day 2 25 min	**Wrap up and clean up:** ▪ Clean up and complete lab journal notes and chart. ▪ Review results of lab. ▪ Based on the lab results, engage in discussion about what amylase is and what it did. Try to direct their conclusion that amylase is a substance (enzyme) that breaks starch down into sugar. It is important here to assess students understanding of the difference between mechanical digestion and chemical digestion. This is a good time to ask relational and cause and effect questions. ▪ Introduce the next lesson, which explores digestion in the stomach.

Assessment: Rubric for Digestion in the Mouth Inquiry

Concept	Method	Novice	Competent	Expert
Know the difference between chemical digestion and mechanical digestion. The teeth and tongue break down food physically and the amylase in saliva begins the conversion of starch to sugar.	Observe during group investigation and by assessing written answers to questions.	Gets the concepts mixed up or does not see the difference between the two processes. States the two processes as one.	Can state the different processes but does not conclude that amylase converts starch to sugar.	Can explain the difference between the two concepts by referring to the parts involved. Can accurately state that mechanical digestion changes food physically and chemical digestion converts starch into sugar.
Process Skill: Define operationally - Create a definition of enzyme	Student question sheet from kit. The question is: On the basis of what amylase did…how would you define an enzyme?	Does not define enzyme as a chemical that converts or breaks down food substances.	Is able to define an enzyme that breaks down food but does not state that enzymes are specific or that they are produced by the body.	Defines an enzyme as a substance that is produced in the body, is specific and facilitates chemical digestion by converting food into a simpler form.
Habit of Mind: Be curious. Be careful and accurate in observations.	Noting behavior and participation during group activity of amylase test.	Does not seem engaged. Either does not write down observations or copies from partner.	Is engaged and interested in what happens in investigation. Is mindful of the results and writes them down.	Is engaged and interested and expresses her enthusiasm to group members. Records data and instructs others to do the same.

Lesson #4
A Hunk, a Hunk of Churning Chyme
Digestion in the Stomach

Relationship of this Lesson to the unit: This lesson is extracted from Lesson 5 of the *Human Body Systems*, the Science and Technology Concepts for Middle Schools™ curriculum. I have followed this investigation step-by-step from the STC-MS teacher and students guide. The procedure is similar to the last two but is a bit more complex. The driving question is addressed in this lesson, by focusing on digestion in the stomach. The nature of mechanical and chemical digestion is reinforced as is the importance of enzymes.

Science Concepts:
Mechanical digestion occurs in the stomach and is called peristalsis.
Chemical digestion of protein begins in the stomach.
Pepsin is an enzyme.

Science Processes: Identify and control variables.

Science Habit of Mind: Know why it is important in science to keep honest, clear, and accurate records.

Activity #4 Materials for Teacher:
- 2 thermometers
- 2 hot pots
- 4 pieces of cooked egg white (not supplied by kit)
- 4 mL of distilled water (not supplied)
- Pepsin
- 4 mL of Hydrohloric acid (HCl)
- Artificial Gastric Juice
- 4 pieces of string
- 4 test tubes
- 1 test tube rack
- 1 metric ruler
- 1 sheet of newsprint
- 1 plastic spoon
- 1 black marker
- 2 containers for clean-up
- 1 box of baking soda for neutralizing
- transparencies (produced from book)
- masking tape

For each student:
- 1 copy of Student sheet: Chemical Digestion in the Stomach

Activity #4 Materials for each Group of four students:

- 1 dropper bottle of HCL
- 1 dropper bottle of pepsin
- 1 dropper bottle of artificial gastric juice
- 3 small pieces of cooked egg white (not included)
- 3 pieces of string (long enough so that one end can attach to egg white which is to be submerged in liquid at bottom of test tube and top of string can be taped to top of test tube)
- 1 metric ruler
- 1 black marker
- 3 test tubes
- 1 graduated cylinder, 10 mL
- 1 test tube rack, 6-hole

Summary of Investigation: Students explore how pepsin and HCl interact to break protein down. Cooked egg whites are used for the protein. They will observe 3 variables; egg white in pepsin, egg white in HCl and egg white in gastric juice (pepsin and HCl) and a control, egg white in distilled water. Since the test tubes with egg whites and liquids require heating for 45-minutes, students cannot complete assignment in one day. The teacher will need to heat the liquids between classes and let them sit overnight.

Session Length: Two sessions.

TIME	PROCEDURE
Prep	Check materials in boxes. Replenish any if necessary. Prepare bottles of pepsin and HCl and Artificial Gastric Juice. Store in refrigerator until needed. Make copies of the handouts for each student. Make transparencies. Prepare the investigation ahead of time for students reference. Prepare control - egg white in distilled water and set up.
Day 1 20 min	Introduction: Read the introduction the the Student Guide with the students. Ask students to write down what they know about stomach digestion in their science journals. Discuss the responses. Summarize the next activity. Emphacize that HCl acid is corrosive and review safety tips. Read the procedure with the students. Ask students if there's anything missing from the setup. If they do not bring it up inform them that there needs to be a control. Ask what the control should be. Show them the control and explain that that is the control for the class. Present the transparency of the Table they will use to document data. Model how to fill it out. Instruct how to dispose of materials. Review how to calculate the volume of something.
Day 1 20 min.	Getters will need to get Pepsin and Gastric Juice since it needs to be refrigerated between classes. They also get goggles and the egg whites and string. Begin inquiry. Each test tube is labeled for the liquid, liquid is measured and poured in the labeled test tuve. Students measure each egg white, tie it to the string and submerge it in one of the liquids. Remind students how to read the liquid level in the graduated cylinder. Reiterate the importance of recording data carefully.
Day 1 5 min	**Clean up** Students will have time to calculate the volume of each egg white and write in their journals.

Day 1	Homework: Read "Spies: Into the Blender" Review "Nutrients: You Just Can't Live Without 'Em"
Day 2 15 min.	Getters get goggles and test tubes from where they were stored overnight. They will carefully remove egg white, measure them and record on the table. They will calculate the volume of each cube and then compare the difference between the before and after. Direct students to record the control test tube.
Day 2 5 min.	**Clean up**
Day 2 10 min.	Students can answer the questions on the Chemical Digestion in the Stomach worksheet. They can use the information from their data sheets as well as from the text they read for homework.
15 min.	**Reflection:** On page 32 of the Student Guide are two photos of the same two test tubes containing ground beef in liquid. One test tube contains distilled water and the other gastric juice. Ask students to think about the nutritional content of beef. Ask what the reddish and white parts of the beef are. Red is protein, white is fat. The discussion should lead to the understanding that the gastric jusices broke down the protein but not the fat portion of the beef. Reinforce the concept that enzymes are specialized. Connect the investigation with the photos, conclude that pepsin breaks down protein in the stomach but needs HCl to activate it.

Organizational strategy: Since I had to keep track of three classes worth of test tubes and did not want to trust the students labeling their test tubes, I created labels for students to adhere to the test tubes. Each group was named after a woman scientist. Class periods are named by letters so the labels on the group's test tubes stated the woman scientist and the letter of the period. In other words, a group for the Potter Lab from period A was labeled Potter A. It worked well. I also included an index card with a brief description on the scientist's achievements. If I were to test students on this activity I might provide a bonus question from this detail. Students would learn to predict bonus questions on future tests, and hopefully pay attention to surprises.

Lesson #5
Getting From Here to There - Difffusion and Active Transport

Relationship of this Lesson to the unit: This lesson is extracted from Lesson 6 of the *Human Body Systems*, the Science and Technology Concepts for Middle Schools™ curriculum. Where Does Your Food Go? Is answered as we learn that chemical digestion is completed in the small intestine.

Science Concepts:
- Diffusion is the process y which molecules spread out from places where they are less concentrated.
- Diffusion is part of why we can smell scents.
- Many functions of the human body involve diffusion.
- Chemical digestion is completed in the small intestine.

Science Processes: Inferring

Science Habit of Mind: Know why curiosity, openness, and skepticism are so highly regarded in science and how they are incorporated into the way science is carried out; exhibit these traits in our lives and value them in others.

Activity #5 Materials for Teacher:
- 1 copy of Inquiry Master: Diffusion and Cell Membranes
- 2 hot pots with test tube racks
- Sugar solution
- Anise extract
- 4 test tube brushes
- 1 substance that will emit a strong aroma (not supplied)
- Clean up materials (not supplied)
- Transparencies (not supplied)

Activity #5 Materials for Each Student:
- 1 copy of Student Sheet Diffusion and Cell Memmbranes

Activity #5 Materials for each Group of Four Students:
- 1 dropper bottle of Benedict's solution
- 1 dropper bottle of Lugol solution
- 1 dropper bottle of distilled water
- 1 dispensing bottle of sugar solution, 125 mL
- 1 dispensing bottle of starch solution, 125 mL
- 1 plastic pipette
- 1 beaker, 250 mL
- 1 graduated cylinder, 50 mL
- 1 funnel (plastic)
- 1 test tube clamp

- 2 test tubes, large, 25 x 150 mm
- 1 test tube, medium, 20 x 150 mm
- 1 test tube rack, 6-hole
- 2 kialysis membranes
- 4 15-cm pieces of string
- 1 dropper bottle of anise extract
- Anise seeds
- 2 balloons, 9"
- 2 plastic resealable storage bags, 10.2 x 15.2 cm (4" x 6")
- 1 black marker

Session Length: Two sessions.

Activity Summary: The final step in the digestive process, the absorption of digested food into the bloodstream, is the focus of this lesson. Students will observe the process of diffusion by smelling aromas in the air, through a balloon membrane and by seeing substances diffuse through a memberane and into another liquid. Students may believe that air escapes from an inflated balloon through the tied opening. The Habit of Mind is tied to this misconception.

TIME	PROCEDURE
Prep	Take inventory of group kits. Add and replenish materials as necessary. 1. Place two membranes in each of eight 250 mL beakers and fill the beakers halfway with water. Ensure that the membranes are submerged. 2. Put two balloons and two pieces of string in a clean plastic bag for each group. 3. Set up the two hot pots and test tube racks. 4. Fill the hot posts with water. 5. Make a copies of Student Sheet: Diffusion and Cell Membranes for each student. 6. Allow the aroma of the chosen substance (cloves, incense, scented candle) to fill the room.
Day 1 45 min	**Introduction and Discussion:** As students arrive, they might remark on the smell in the room. Direct their attention to the source and have them come closer to it. While students are standing near, demonstrate a visual metaphor by dropping one drop of food coloring in a large container of water. Introduce the lesson and ask, How do you think the scent reached your nose? Was the aroma stronger at one place than another? If so, why? Direct discussion to conclude that the aroma is stronger because is is more concentrated at the source. Proceed with discussion by asking if students think that diffusion could occur through something that seems to be impermeable, such as plastic or rubber. Entertain their responses but do not come to any conclusions. Show them the membrane they will be using in their inquiry. Explain that although the membrane is synthetic it can be used to simulate some of the characteristics of living cell membranes. Since there is not enough time to begin Inquiry activity students can read the text

	at the end of Chapter 6. Provide a check-off sheet to help students focus on the important concepts. Assign readings for homework if they were unable to finish in class. Review safety procedures. Read procedure or the inquiry with the students.
Day 2 10 min	Review procedure briefly. **Inquiry:** Getters get safety goggles. 1 Students add starch solution to one membrane and place in labeled test tube. 2 Then sugar solution is added to the other membrance and placed in other test tube labeled sugar sol. 3 Put 8 mL of water in each test tube. 4 Place the test tube in a beaker or test tube rack. Let the test tubes sit for 15 min.
Day 2 15 min	**Interim Activity:** While students are waiting they can complete the following activity using balloons and anise seeds and extract. 1 Open container of anise seeds. Smell them. What do they smell like? 2 Put about 10 seeds into the balloon. Blow up the balloon.Tie the balloon. Pass the balloon around and let everyone in your group smell the seeds through the walls of the balloon. Can you smell the seeds through the walls of the balloon? Why or why not? 3 Put 5 drops of anise extract into the other balloon. Inflate this balloon and tie it securely. Pass it around to let everyone sniff it. Can you smell the anise extract through the wall of the balloon? Why or why not? 4 Discuss with your group the following questions: How does the strength of its aroma compare with that of the seeds in the balloon? What might explain the difference?
Day 2 15 min	**Resume Inquiry:** 1 Perform a chemical test for sugar on the water from the test tube with the membrane containing sugar solution. 2 Perform a chemical test for starch on the water from the test tube with the membrance containing the starch solution. (Since students have conducted the starch and sugar test multiple times, they will be responsible for knowing how with minimal direction. The kit gives basic directions. 3 Record your results on student sheet. 4 Discussion: Ask students to share their results. Remind them of the question asked earlier, whether they think diffusion could occur through something that seems to be impermeable. Why did the sugar pass through but not the starch? Explain that digested food is absorbed through the walls of the small intestine into the bloodstream and lymph vessels in several ways. Certain nutrients pass through cell membranes by diffusion, similar to the way sugar passed through the membrane. Some nutrients pass through cell membranes through cellular respiration also called active transport. Active transport requires cellular energy. Cellular respiration will be investigated during the study of the Respiratory and Circulatory System.
Day 2 5 min	**Clean up** **Homework:** Complete student sheet.

Lesson #6
You are what you eat - or are you?
Culminating Activity

Relationship of this Lesson to the unit: This lesson is designed to give students an opportunity to use their knowledge from the previous 5 lessons on the Digestive System. In this final project students will work in groups of 3-4 to choose a healthy snack and prove why it is healthy by conducting a test, reading labels and doing research. As part of the project they will be required to advertise the snack (product) through the medium of their choice. Their final advertisement may be made public school-wide. This is a five-day assignment. This is not intended to be a huge production.

Science Concepts:

Science Processes: Experimenting

Science Habit of Mind: Respect for Evidence

Activity 6 Materials for Class:

- Students choose materials, have many possibilities available such as Biuret's solution (protein), Lugol solution (starch), Benedict's solution (sugar), Vitamin C Reagent, Sudan III stain (fats)
- Parents are asked to volunteer to donate food items. (letter to parents at end of document)

Session Length: Five days

Students are given an outline of project expectations, deadlines, and rubric. A note to parents is sent home to inform them of the project. Students will be required to do some of it at home. Outline follows.

Group arrangement: Students will work in groups of 3-4. Groups can be organized by teacher's disgression.

Science Activity Unit - Digestive System

For the next few weeks you will be exploring the digestive system. You will be conducting a number of tests and investigations. At the end of this unit you will have the opportunity to apply your knowledge to a multi-faceted project. You will design your own experiment, product and advertisement. You will only have 5 days to complete the assignment. Please read the outline below so that you can be forming some ideas while investigating *where our food goes*.

Final Digestive System Project - Design a Healthy Snack

You work for a popular food manufacturer. The marketing department has researched family demographics and have concluded that parents and schools would purchase healthier snack foods for their kids. Your team has been assigned to create a healthy snack food to sell in school cafeterias and grocery stores.

The teams for your organization are made up by an advertising associate, 1 or 2 chemists and a nutritionist. Each role will require a writing assignment, data documentation and research.

1. The healthy snack must include 2 of the three main food groups, carbohydrate, proetein or fat, and one or two from the mineral and vitamin category.

2. One test must be performed to prove the presence of the above food groups, more tests are better. You must begin with a hypothesis, well stated, and write the procedure before conducting the test.

3. The food does not have to be created from scratch but cannot be fresh out of a package. It can be something that may exist, but you must sell it as a new product. (ask for clarification if you have questions)

4. Your final product can be a:
- Poster
- radio advertisement
- TV ad
- magazine ad

5. Everyone has a role. Decide on who will be what.

Deadlines:
First day - Groups are assigned. Decide snack, group roles, and final product. Where will the snack come from? What will be produced at home?
Second Day - Write hypothesis, proposal, procedure, list of materials
Third Day - Begin food testing and document results.
Fourth Day - Create and finalize ad
Fifth Day - Present ad - share your snack (optional)

If there is a problem acquiring the food you need for your snack see me.

Criteria for Snack Design

Names of Team Members Role

_____ _____

_____ _____

_____ _____

_____ _____

- Name of snack: _____
- List of ingredients or foods needed:

_____ _____

_____ _____

_____ _____

- Hypothesis (write final draft in your science journal):

_____

_____

- Procedure (write final draft in your science journal):

_____

_____

_____

_____

Type of advertisement: You must include why snack is healthy on any of these choices.

- Poster - 11" x 17" or larger. Full color
- Radio Ad - The text/dialoque is all that is required. If you have time to record the ad go for it!
- TV Ad - The text/dialoque and description is all that is required. If you have time to video the ad go for it!
- Magazine Ad - 8.5" x 11". Full color

Grade Rubric for Snack Design Project

	0 - 64 Below the standard	65 - 79 Almost meets the standard	80 - 90 Meets the standard	90 -100 Exceeds the standard
Experiment 50% of grade	Hypothesis is not clearly stated and is not measurable or testable. Test is not conducted properly or the evidence has been altered. Data is not clear or conclusive. No conclusion that disproves or proves hypothesis.	Hypothesis is clearly stated but is not measurable or testable. One test is conducted. Procedure is not clear or detailed. Experiment follows procedure but because the procedure lacks details there were problems with the process. Data is not neatly documented or is altered. Measurements are not precise. There is no control variable. The conclusion does not clearly state whether the hypothesis was proved or disproved.	The hypothesis is clearly stated is measurable and testable. One test is conducted. The procedure is written clearly but lacks some details. The experiment follows the written procedure but because some details are missing there were problems with the process. Data is documented but measurements were not precise. There is a control. The conclusion states whether the hypothesis was proved or disproved.	Hypothesis included two tests and is clearly stated. It is related to the assignment. The procedure is written in detail and followed. Data is collected systematically and documented neatly and with respect for evidence. Measurements are precise and a control variable was included. The conclusion is stated and reflects whether the hypothesis was proved or disproved.
Advertising Text 20% of grade	Minimal text is written. It does not sell the product. Ingredients are not listed. Many spelling and grammatical errors.	Text is not creative. It is not written to sell a product. Some ingredients are listed. There are many spelling or grammatical errors.	Text is creative and written to sell a healthy product. The healthy ingredients are listed. There are very few spelling or grammatical errors.	Text is dynamic, creative, and written to sell a healthy product. The healthy ingredients are listed. The product is named. There are no spelling or major grammatical errors.
Group Effort 20% of grade	Rarely participated in group discussion. Did not present own ideas. Rarely listened to others. Minimal effort in any duties.	Sometimes participated in group discussion. Did not present own ideas. Sometimes listened to others. Some effort in some duties.	Often participated in group discussion. Sometimes presented own ideas and listened to others. Did not encourage others to participate. Showed effort in most duties.	Often participated in group discussion. Presented ideas and listened to others. Showed enthusiasm. Took leadership role or encourage other members to participate. Showed effort in all duties.
Presentation 10% of grade	The purpose of the assignment is not outlined by the text and/or graphics. If visual, the graphics are minimal and are not related to the subject.	The purpose of the assignment is vaguely outlined by the text and/or graphics. If visual, the graphics are minimal and are not related to the subject.	The purpose of the assignment is vaguely outlined by the text and/or graphics. If visual, the graphics relate to the subject.	The purpose of the assignment is clearly outlined by text and/or graphics. If visual, the graphics relate to the subject and are creatively presented.

If I Had More Time!
A Reflection on Using the SCT/MS™ Kit to Teach and Design a Unit

As a novice teacher, I find designing science units somewhat overwhelming. I became completely dependent on the STC/MS™ Human Body Systems Curriculum. At times this was a positive dependency yet at other times I felt somewhat inhibited. The final unit follows the STC/MS™ kit almost word for word except where I was required to add particulars such as Process Skills and Habits of Mind, which are not addressed in the curriculum.

It truly helped to have the kits as a guide for teaching the two lessons (reflection follows). I can see that with experience I could adapt the lessons from kits to create my own unique lesson plans. At this time, however, I found it necessary to focus on the concepts and procedures that the kit provides. What makes teaching from kits a bit inhibiting is considering the student population. The kit assumes that students have background knowledge to support some of the activities. I became aware of the problems associated with the lack of background knowledge when teaching at Kickemuit Middle School.

Another problem with designing this unit is that it was created in a vacuum. Except for the two lessons, I could not predict how much time each task or procedure would take. I know from my experiences at KMS that there is never enough time. Actually, the most prominent lesson I learned from this (besides the lesson, to be prepared) is that there is never enough time. I feel I faked the time slots just to fit in all I wanted to fit in. I know I will continually need to tone down and weed out all the science I want to teach.

I attempted to include as many of the requirements as possible. I am sure I left out some items such as the required rubrics. I included a grading rubric for the final project and

know that it needs work. I welcome constructive criticism, as I am sure I will be using this tool often. As a career changer I lack the science background that many of my fellow cohorts have. I know I lack the vocabulary and understanding of many science inquiries. I struggled with that aspect while planning this unit as well. The digestive system is a good topic for this reason. It is a familiar subject and the lessons were straight-forward. The drawback is that it might not be as exciting to adolescents as other subject areas. On the other hand, the challenge is to create the excitement and project based science is designed to do that.

The final project of my unit attempts to fit in true inquiry. It may seem a stretch and I am unable to test to see if students would enjoy it. The time I allotted is clearly not enough but I figured that in real-life, little time is going to be dedicated to the digestive system. I welcome comments on this as well. It was important to me to fit in the final project. Since there are only five days the homework for this period will be working on this assignment. I also realized that food items will be needed therefore I am soliciting parental involvement. In the letter (found at the end of this document), I ask for parent acknowledgement of the assignment as well as an option to volunteer to provide food items. In order to accommodate the final activity, I decided to disclude some lessons from the kit. If I had more time I would have included Surface Area and Absorption and the exploration on Energy From Food using the measuring of Calories and the burning of food activity.

In addition, if I had more time I would include websites for students to navigate. They could be included as a way of differentiation. Students who finished early could visit the sites or students who have difficulty reading may benefit since many of the sites I found are designed for younger students. The following site could be useful for exploring many of the

human body systems. It could be used throughout the wider unit on the human body. You can visit the site at: http://kidshealth.org/kid/closet/movies/how_the_body_works_interim.html

The discrepant event was found on the internet as well. It was difficult deciding whether to use the Total® cereal demonstration or the surface area one. As the unit developed I had to leave out the surface area lesson so the discrepant event, although more dramatic, could not be included. The Total® cereal activity can be viewed at: http://www.mcrel.org/whelmers/whelm07.asp There is certainly no shortage of ideas for science activities. The challenge lies in judging whether the activity is a good one, whether is fits in with the curriculum or whether you have time to include it.

In conclusion, I found that using the STC/MS™ Kit comforting. The lessons I used from the kit however, are quite cookbook style. I attempted to create part of the unit as a truly project based investigation and I am content with that. I feel that the unit has a lot of evolving to become truly project based and can only evolve once I am a classroom science teacher. Hopefully that will be soon!

Science Activity Unit - Digestive System

Reflection of Teaching Assignments

I was fortunate to teach two, two-day activities at Kickemuit Middle School in Warren, Rhode Island. There were three classes of eighth grade students - one of which consisted of high-achievers while the other two were of more diverse levels. I experienced observing most of these students and so became quite comfortable with them and the classroom in general. The science educator for this group of students is a career-changer like me, but veteran teacher of close to 17 years. Ms. P mentored me throughout the process and I am grateful to her and the school for the extent at which they accommodated me. I became quite comfortable with the students as did they with me, however, I believe I learned more than they.

When we discussed the teaching arrangement, I suggested that I teach around Ms. P's curriculum plan. They were about to embark on a unit from the STC - MS kit called the Human Body. Based on our mutual schedules it worked out that I teach a few activities from the Digestive System. The Digestive System is not the most exciting topic for me but realized I will never have a real choice as to what to teach and that any aspect of science is interesting. I have such a steep learning curve that a fairly familiar topic worked well. It helped that I could observe Ms. P's instsruction of the lesson prior to mine. I was given complete flexibility to use the copier, classroom, and lab closet in preparation for the lessons. I was even hired as the substitute teacher for part of some of the days when Ms. P was out, hence, I was also compensated for this time.

I remember feeling extremely anxious about being unprepared, therefore I planned the first day's activity with rigor. Even though the kit gave step-by-step instructions, I came to the conclusion that index cards and a detailed instructional plan was necessary for me to feel at ease. The first day was quite successful. Student behavior was extremely positive, which I contribute to the video camera that was in use. The students generally followed procedure, listened,

cooperated and participated. After the first lessons, I was able to assess individual student behavior in more detail. In the future, I will use the anectodal note-taking form of assessment.

The second day was disappointing. There was no camera and their teacher was out. In addtion, I had not planned enough extra activities for the students who finished the procedure. The activity was intended for one day but because of misunderstandings, many groups had to redo or continue the next day. The students who finished early were not interested in the activities I suggested, rushed through them, and were bored. I found there were a lot of behavior issues. I learned that it is not only important to have independent activities for differentiation, but that the activities are interesting and useful. Also, differentiated instruction needs to be an integral part of their daily schedule. Because this group was not familiar with group roles I could not enforce the habit of writing their assessment of how their group worked as a team, which would help fill time. There are a number of ways to fill time appropriately. In the future I would assess whether the activity is trully worth more than the time allotted. If not, I would arrange the lesson so that it was guaranteed to be completed. On the other hand some lessons will be worth the extra time. Flexibility is important for teaching science.

There was a range of participatory and ability levels among all the classes, which has helped me immensely in considering the planning of my unit and future units. Some students were unmotivated to the extent that they just sat there while others did the whole procedure for their group. There were a few students who exhibited frustration because they did not understand the directions or why they were conducting the activity, yet they were persistent in getting the help they needed and followed through to the end. It is clear from some of these behaviors that many students come to class with different background knowledge or none at all. The STC-MS kit clearly developed investigations which built upon each other. Without the understanding of the

first investigation students were going to be left behind and lose interest. As a result from experiencing these classes, reading constructivist pedagogy such as "The Having of Wonderful Ideas" by Martha Duckworth and the textbook, I am convinced that we learn by building upon knowledge. I will need to assess my students early in the year to learn what they know. I plan on conducting a number of assessment activities that will allow me to plan the "messing around" activities students may need in order to proceed to the next level of understanding.

Some other understanding issues I discovered were; the inability to follow directions, the inability to understand the procedural text, and how to extract important information from text. Since I have completed the first weekend of the Content Area Reading and Writing Skills course, I learned some skills for helping these students achieve understanding. For example, I can use the

K-W-L strategy, provide an activator questionnaire prior to reading, model the reading of text, and read carefully the procedural directions with them. I will use the activator questionnaire indefinitely or until I have assessed that all students can read independently with understanding. I will probably model procedure often in the early part of the year and review as necessary. Another idea is to offer students the opportunity to model the reading of procedure. This could be used as a form of assessment as well.

Preparation for the investigations are quite time-consuming. Since the first activity contained most of the materials from the previous investigation I had not appreciated the time Ms. P spent to arrange them until my second activity. The complete Human Body Unit comes in about 7-8 large crates of packaged items including an inventory sheet on each box. The kit is designed to provide groups with a box containing all the materials necessary for the investigations but it is the educator who has to combine and sort all the individual items. I had to

cut a number of lengths of string, boil eggs and dice them as well as prepare solutions, to name a few. Some of these items are not included in the kit. As the unit progresses the materials change, therefore it is necessary to plan a large amount of prep time. Without carefully assessing that each group has the materials they need and ensuring there is enough Lugol's for example, a class will not go smoothly. Hands-on science is more work and it is important to include time to prepare.

There were times when I forgot to take the substances out of the refrigerator between classes or put out enough test tubes. I found myself running to get them when a "getter" came to tell me there were not enough test tubes. I did not mind that they knew I forgot. Students need to know I am human and I make mistakes. Another unpredictable potential failure occurred when I decided to personally conduct the second investigation to ensure it worked and to understand better how to teach the procedure. The investigation - exploring how pepsin and Hcl break down an egg white (protein) - takes two days because it has to sit overnight to show any results. When I checked the test the next day it did not look like the chemicals broke down the egg white. When I discussed this with Ms. P, my idea was that we could fake it. She was abashed and said they had just had a lesson on ethics. We discussed for awhile and decided to see if the students got the same results. If their tests did not work I would ask them if they think I should have faked it? Hopefully that would assess whether they internalized the ethics issue. As it turned out the test did work and because the egg whites broke down at such a small increment it was difficult to tell without measuring the pieces. I concluded I should have followed the procedure until the end and not jump to conclusions. Bad science on my part.

Since I focused most extensively on instsructional style and procedure I did not address assessment to any real extent. I did walk around the room, was available for questions and read

some of the questionnaires studenst answered. I concluded much from this small amount of feedback. I am most concerned that students understand and am confident that I will spend a great deal of time learning how to teach for understanding. Finding the balance between ensuring all students understand and fitting in all the curriculum will be a challenge. One of the things I will need to learn is knowing when to move on.

In conclusion, the teaching of the two activities was an invaluable experience that put my mind at ease about teaching science. Using the STC-MS kit contributed to the confidence I gained. Actually spending time in front of students helped me realize I am comfortable in front young adolescents. I enjoyed being with them. Overall, I learned that to teach science to middls school students an educator needs to be flexible, conscious of individual needs, and above all - prepared.

Dear Parents,

Your child is about to embark on a science unit about the digestive system *called "Where Does Your Food go? What a Long Strange Trip it is."* At the end of the unit, students will be organized in groups for a final project. They will have five days to complete this assignment, therefore they will need to do some of the work at home. Your child will have specific duties as a member of a team of colleagues who work for a food manufacturer. His/her team have been assigned the task of designing a healthy snack to be sold in school cafeterias and grocery stores.

Each student will play the role of chemist, nutritionist or advertising associate. All students will participate in the creative process and will design an actual experiment. There will be writing assignments and research for all. In the end the

students will have expressed what they have learned while learning how to design an experiment. It is my hope that all students will enjoy this process.

Below is a form for you to fill out to let me know you are aware of the assignment. Also, if you are able to supply any food items that our students might need to create their product please let me know.

Thank you, Lori Vastano

Student Name _____

I have read the letter and understand my child will be involved with a group project.

Signature of parent _____

☐☐☐ Yes, I can supply food items for this project.