Lesson Title: Food Waste and Sustainability Investigation	
Grade Level: Middle School Grades 7 and 8	Subject Area: Life Science
John Armbruster, Depoali Middle School	Lesson Length: Multiple Days

Lesson Overview:
This 5E lesson introduces students to food waste and sustainability by engaging them in a local site-based investigation. Their local investigation prompts them to dig deeper and research the environmental, economic, and social consequences of food waste at national and global scales. Students research real world examples of food waste reduction initiatives and evaluate them as potential solutions at their school. Students develop a plan to reduce the amount of food waste produced at their school and deliver a detailed presentation to their class.

Phase One: Engage the Learner

Begin the lesson by posing several engaging questions to students and direct a class discussion on the topic of food waste:

- "What are some examples that you have seen or know about where perfectly good food was thrown in the trash?"
- "Where does the food waste go after it is thrown in the trash?"
- "What are some reasons that students throw away food instead of eating it?"
- "What kinds of foods get thrown in the trash in the school cafeteria?"
- "How much food is thrown away on a daily basis in the school cafeteria?" (Driving Question)

The last question in this list is intended to drive the investigation in phase two. Ask students to record their estimation of the amount of daily food waste at their school. Present students with some statistics about the shocking amount of food that is wasted in the U.S. http://www.epa.gov/foodrecovery/ .

Have students work in small groups to brainstorm possible ways to measure the amount of food waste produced at their school. Possible methods for measuring food waste include: placing special trash bins for the collection of food waste in the cafeteria, asking students to record the amount of uneaten food that they personally throw away in the cafeteria, surveying students in the cafeteria about how much food they throw away in the cafeteria.

Students will share their ideas about measuring food waste, and the teacher will direct a discussion weighing the various options proposed by students. During this discussion the teacher will use guided questioning in order to point out advantages and disadvantages of different methods. The teacher will guide the discussion in favor of measuring the mass of food waste produced using special trash bins in the cafeteria.

After discussing possible methods for measuring food waste and deciding on the preferred method, the teacher explains that because of health and safety concerns the class will only be able to collect uneaten fruits and vegetables that get discarded in the cafeteria.

This material is based upon work supported by the National Science Foundation under grant number EPS-0814372

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What is the teacher doing?	What are the students doing?
• Direct discussion on food waste. • Provide guidance to students while devising a plan for measuring the amount of food waste produced in the cafeteria.	• Respond to the question "How much uneaten food gets thrown in the trash everyday in the school cafeteria?" • Estimate the mass/weight of the food waste produced daily in the cafeteria.

Phase Two: Explore the Concept

Students will work in small groups to outline a plan for collecting and measuring the amount of fruit and vegetable food waste produced by students at their school.

Students will collect uneaten fruit and vegetable waste in special trash bins that have been clearly marked and placed in the school cafeteria. At the end of a predetermined time period the waste will be transported to an area where the food waste can be taken out of the bin and data collection can take place.

Paying close attention to health and safety concerns, students will observe and record the types and amounts of fruit and vegetable waste that was collected in the designated bins. Consider using a food waste log like this one provided by the EPA. http://www.epa.gov/epawaste/conserve/pubs/food-waste-log.pdf

With direction from the teacher, students will analyze and present their data in the form of tables and graphs. There are a several possibilities for representing the data including: using tables to show the amount of food waste collected on each day or week, using tables to show the amount and type of food waste collected per day or week, using a bar graph for the total amount of food collected per day or week, using a bar graph for the total amount of each type of food collected per day or week, using a pie chart to show the percent of each food type collected.

After students have modeled the data using tables and graphs have the students summarize their findings in written form.

What is the teacher doing?	What are the students doing?
• Provide students with surgical gloves • Weigh food waste. • Direct students when calculating estimates of food waste.	• Work in small groups to devise a plan for measuring food waste. • Place special trash bins in the cafeteria for fruit and vegetable waste. • Create signs for the trash bins • Make observations and record data • Analyze data and generate tables and graphs

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Phase Three: Explain the Concept and Define Terms

Students will use informative resources such as news articles, government reports, food waste blogs, podcasts, and documentary films to learn about the role of agriculture in global climate change and how reducing food waste may have a mitigating effect on climate change. Students will also research real world examples of food waste reduction initiatives and evaluate them as potential models for reducing food waste at their school.

Suggested reading (all links were obtained from http://www.wastedfood.com/press/):

- http://www.fao.org/fileadmin/templates/nr/sustainability_pathways/docs/Factsheet_FOOD-WASTAGE.pdf
- http://www.washingtonpost.com/postlive/in-united-states-theres-a-lot-of-food-being-wasted/2012/06/14/gJQAmk9JoV_video.html
- http://www.huffingtonpost.com/jonathan-bloom/how-avoiding-food-waste-a_b_775639.html
- http://www.nrdc.org/food/files/wasted-food-IP.pdf

Suggested Podcasts:

- http://www.epa.gov/waste/conserve/smm/foodrecovery/podcast/foodwaste111512.mp3
- http://www.epa.gov/waste/conserve/smm/foodrecovery/podcast/foodwastetranscript111512.pdf

What is the teacher doing?	What are the students doing?
• Provide age-appropriate informative texts on the topic of food waste, agriculture, and climate change. • Provide access to computers and a list of relevant and credible online sources. • Provide comprehension questions that prompt students to identify critical information from informational texts.	• Examining a variety of resources • Taking notes • Group discussions

Phase Four: Elaborate the Concept

Using presentation software, students will work in small groups to develop a presentation to promote a plan for reducing the amount of food waste at their school.

What is the teacher doing?.	What are the students doing?
• Provide students with access to computers and presentation software. • Provide students with a presentation rubric.	• Describing the problem using evidence from informative texts and their own school investigation

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Phase Five: Evaluate Students' Understanding of Concept	
Students will present their plans	
What is the teacher doing? • Evaluating student understanding and using a rubric. • Prompting students with questions.	What are the students doing? • Delivering presentations to the class using presentation software.

Please share your comments about successes with this method with John Armbruster, c/o Depoali Middle School, 9300 Wilbur May Parkway, Reno, Nevada 89521, 775-852-6700 or by e-mail: John Armbruster < JArmbruster@washoeschools.net >

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