SAN MATEO COUNTY Sustainability Department	**5E Lesson Plan – Litter Collection Event** **5th – 12th Grade**

Standards and Topic Connections:

One Planet Topic	CA Standards: Next Generation Science, Common Core, English Language Development Standards	Environmental Principles and Concepts (EP&Cs)
Consumption and Waste	**Grade Levels and Standards**	**Principles**

	Next Generation Science Standards: 1) 5th Grade: 5-ESS3 2) Middle School (Grade 6 – Grade 8): MS-LS2, Ecosystems: Interactions, Energy, and Dynamics; and MS-ESS3, Earth and Human Activity 3) High School (Grade 9 – Grade 12): HS-LS2, Ecosystems: Interactions, Energy, and Dynamics; HS-ESS3: Earth and Human Activity *California Common Core Standards Mathematics*: 1) 3rd Grade – 5th Grade Measurement and Data: 3.M.D, 4.M.D, 5 M.D. 2) 6th Grade Expressions and Equations: 6.E.E. 3) 7th Grade Ratios and Proportional Relationships: 7 R.P. 4) 8th Grade Functions: 8F. 5) Higher Mathematics Standards by Conceptual Category - Statistics and Probability, Interpreting Categorical and Quantitative Data: S ID *California State English Language Development Standards:* Grades 3-12 fitting into Interacting in Meaningful Ways, Part 1: 1) Part 1, A.1 2) Part 1, A. 3 3) Part 1, B. 5 4) Part 1, C. 10	 **Principle IV** The exchange of matter between natural systems and human societies affects the long-term functioning of both.  **Principle V** Decisions affecting resources and natural systems are based on a wide range of considerations and decision-making processes.

Purpose / Learning Objectives:

- The students will be able to (TSWBAT) do the following:
- Identify various types of litter.
- List the various items that can be landfilled, composted or recycled.
- Explain approximately how long it takes various types of items (litter) to decompose.
- Explain the effects that litter has on an ecosystem.
- Take action to prevent littering
- Calculate averages and percentages
- Graph data

Driving / Essential Question(s):

- How do our choices affect ourselves, our communities, and the world we live in?

Lesson Terms / Academic Vocabulary:

- Litter
- Ecosystem
- Decompose
- Landfilled
- Composted
- Recycled
- Percentage
- graph

Background:

Before beginning this lesson, students will understand that an ecosystem is the interaction of living and non-living things in a specific area. Students will comprehend how garbage/litter can affect the environment and an ecosystem. Students (5th grade and up) will also understand how to use data to create graphs.

Lesson plan is based on the 5E Model: *Engage, Explore, Explain, Extend/Elaborate, Evaluate*	
Engage	**Pre Lesson Assessment** (Time varies on extent of students' answers): Approximately a week before the lesson (Litter Collection Event) teachers will have students answer the following questions below in their notebook. Therefore, the teacher will be able to evaluate the students' knowledge about this subject via students' answers. 1. What types of litter have you seen on the side of the road, sidewalk, park, beach, creek bed, or even the school playground? Instead of polluting the environment, what should people have done with it? (Answer: Types of litter will vary from plastic bags, candy wrappers, cans, water bottles, tires, cigarette butts, diapers, etc. People should have reused, recycled, composted or landfilled –these items).

	2. How long does it take for these items (types of litter), mentioned in your answers to Question 1, to decompose? (Answer - varies: Aluminum cans break down in about 350 years. Glass bottles do not break down. Styrofoam cups do not break down. Notebook paper takes about 3 months.) Please refer to the following sources for estimated decomposition times for various items: West Virginia Department of Environmental Protection: How long does it last . 3. What happens to the different types of litter if it is not picked up by people? (Answer - varies: It contaminates an ecosystem. Animals may eat things like cigarette butts and get sick. Plastic litter may eventually enter the storm drain or creek and wash down into the bay or ocean. Animals can be entangled by plastic and drown. People and pets can get cut up on broken glass.) 4. Why do people litter? (Answer - varies: Some people litter because they are lazy. Others litter because they cannot find a garbage can. Anti-litter laws are not enforced.)
Engage and Explain	**Pre-Lesson Activity** (Time ~ 20 minutes): *Instructional Materials*: Poster Paper, Markers *Instructions:* (The students will review the four questions that they answered in their notebook to create a classroom discussion. This will help students share their prior experiences and knowledge with one another.) 1. The teacher will divide students into groups of threes or fours. 2. The teacher will have students collaborate with one another in each group to answer one of the four questions on poster paper. (Depending on the number of students in each class, two groups may answer the same question.) 3. The groups will post their answers on the wall and each group will present their answer to the entire class. 4. At the end of each presentation the teacher will ask the students if there is anything else that they would like to add, and note it on the board. If answers to questions are not completely covered, the teacher will add more information to the answers. During this time the teacher will also review with students about the different items that can be recycled at school or home. (Check with your local haulers –garbage companies for a complete description of these items. The following website has links to the different haulers in San Mateo County: https://www.smcsustainability.org/waste-reduction/collection-services/). 5. Teacher will briefly talk to students about the litter collection lesson that they will do the following day.

Explore, Explain, and Evaluate	**Lesson - Litter Collection Event** (Time – Varies Depending on Size of Litter Collection Site): ***Instructional Materials and Resources:*** Buckets / Masking Tape / Clip Board / Pencils / Compostable or Plastic Bags / Gloves / Bathroom Scale / Litter Grabbers (optional) / Litter Collection Log / Lab Notebook or Lab Student Worksheet / On-line Graphing Program - Kid's Zone Learning With NCES: http://nces.ed.gov/nceskids/graphing/classic/ (optional) ***Instructions:*** 1. Teacher will select an area for litter collection. This area may be a creek bed, trail, sidewalk, beach, or even the school's grounds, etc. 2. Teacher will explain the litter collection lesson to students. Teacher will also inform students that even if organic waste such as dirty paper is found on the site, it will be disposed of as "garbage". This is due to the fact that it is not known whether the paper has been contaminated with other substances, etc. Additionally, the teacher needs to inform students that they will not collect any hazardous waste such as motor oil. The students will be responsible to take note of its location, so the teacher can inform a qualified adult such as maintenance staff to properly dispose it. 3. Students will make a hypothesis of what they expect to collect as litter in the selected area. Students will note this in their lab notebook or lab worksheet. Students will also note down the materials and methods of this activity in their lab notebook or worksheet. 4. Divide students into Groups of twos and threes. 5. Each group will have a piece of masking tape, two buckets, clip board with log, gloves, and litter grabbers (optional). 6. Students will label one bucket for "garbage" and the other bucket for "recyclables" using masking tape. Students will also layer buckets with compostable plastic bags. 7. Students will weigh buckets with bags inside them and note the weight of each bucket in their lab notebooks or worksheet, as noted: *weight of recycling bucket before litter collection and weight of garbage before litter collection*. 8. Students will put on gloves and go out to the selected area for litter collection. Teacher can also assign a specific quadrant to each group (upper grade students) in the selected area for litter collection to create a comparison study. 9. Students will switch jobs: one student will log items found in the Litter Collection Log (attached) and the other student(s) can place the item (litter) either in the "garbage" or "recyclables" bucket. 10. Data Analysis: Students will note the following calculations and graphs in their data

	analysis section in their lab notebook or worksheet. a) After litter is collected over a period of time, the students will weigh the buckets with the litter. They will note the total weight of each bucket and then calculate the weight of the litter in each bucket by finding the difference of the bucket before and after collecting litter. b) Students will note the weight of litter collected by each group and then calculate the total weight of litter for the entire area (litter collection site). Students will then make a bar graph of this information. c) Students will note the total number of items collected by each group and then calculate the total for the entire area (litter collection site). Students (5^{th} grade and up) will make a bar graph of this information. Students can also use computer programs to create a pie chart of this data, etc. d) For middle and upper grade students: Using the data collected students will calculate the total percentage of litter that should be recycled and litter that should be landfilled. e) For middle and upper grade students: Using the data collected students can calculate the percentages of each item found in the entire area. f) For middle and upper grade students: Students will create graph(s) to compare data from Step d and Step e above. g) For upper grade students: If teacher had students collect litter from specific quadrants within the entire area then students will compare data found by the other groups in their quadrants by determining percentages of each item found in quadrant and through graphical analysis. 11. Conclusion: Based on analyzing the data, students will note their conclusion in their lab notebooks or worksheets, whether or not their hypothesis was supported. The students will also explain what could of happened to the litter if it was not collected and properly disposed of.
Extend / Elaborate, and Evaluate	**Possible Assessments:** 1) The teacher will review students' lab notebooks or worksheets to check for understanding. 2) Students will write a reflection of what they have learned from this lesson. 3) Students will create a word bank using the new vocabulary that students learned during the lesson: The word bank may include the following words and others that the teacher would find

<table>
<tr><td></td><td>appropriate for this lesson: litter, ecosystem, decompose, landfilled, composted, recycled, percentage, graph.
Example Word Bank:
<table><tr><td>Word</td><td>Your own definition</td><td>Picture or Example</td></tr><tr><td>Litter</td><td></td><td></td></tr><tr><td>Ecosystem</td><td></td><td></td></tr></table>
4) In the unit exam students will answer various questions about this lesson; these questions can be based on the pre-assessment questions.</td></tr>
<tr><td>Extend / Elaborate</td><td>Continuation / Furthering the Lesson:

1) Students can develop anti-littering campaign at school or in the surrounding community: Fellow students, school staff, and the community at-large can be educated through signage, the school’s newsletter, assemblies / rallies, contests, daily announcements, etc.</td></tr>
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